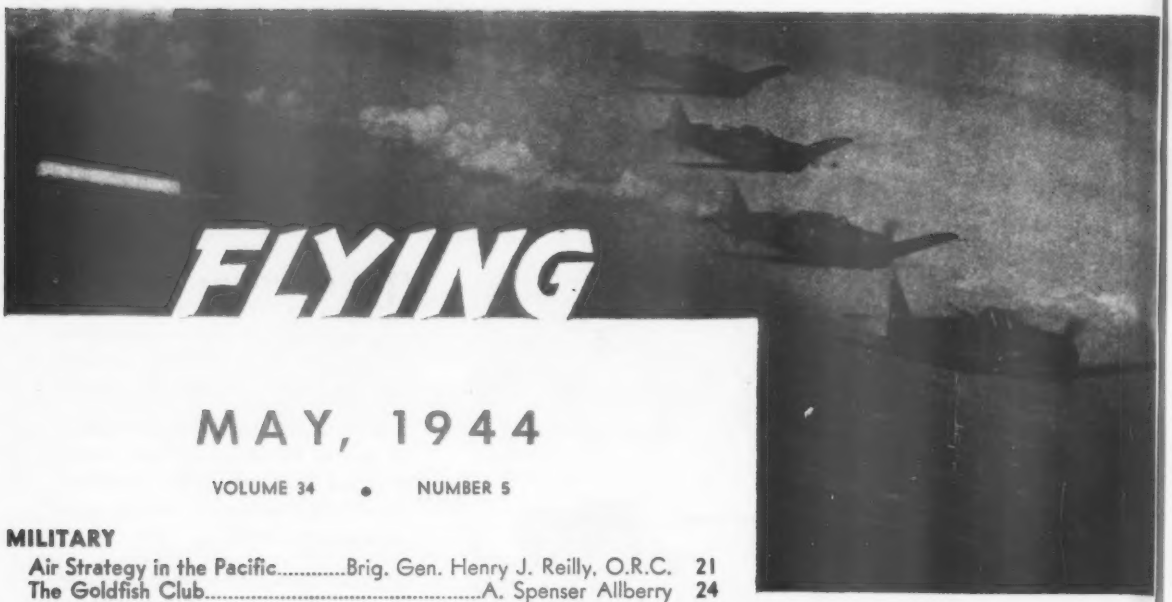

FLYING

MAY, 1944

VOLUME 34 • NUMBER 5

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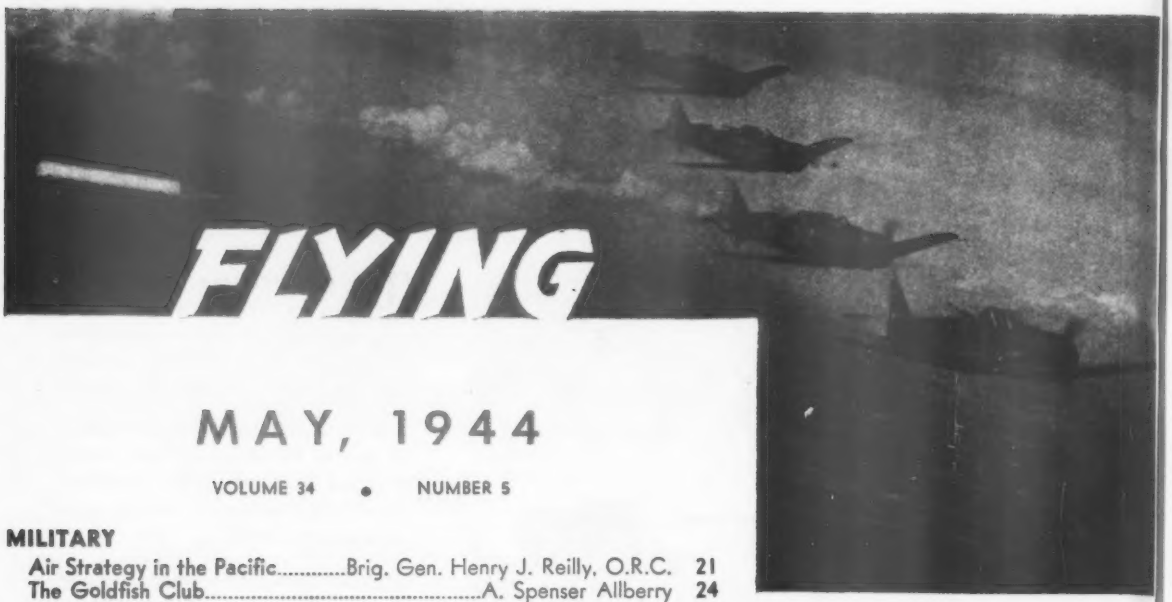

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To All Men in the Armed Forces

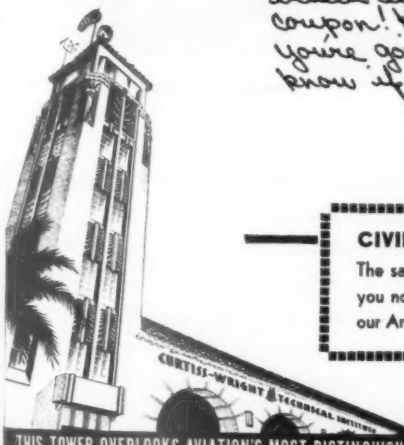
You can bet your life no one needs tell you fellows about aviation. You know! No matter what your branch of service, air forces are an integral part of your outfit, making your progress sooner, quicker, and more certain. Without air power we probably never could win—but we've got it—and you know will win!

You also know how rapidly aviation has developed—how it has grown from a crawling babe to a charging giant. No sir! You can't stop a good thing like American inventive genius. And it won't stop with the war, either. Paces very likely will bring true our wildest dreams of air progress. The Age of Flight? We're practically there already!

In addressing this letter to you we want you to know that many far-sighted men in the service are planning now for their careers after the war. They are determined to be a part of the most promising industry of the future—Aviation—and to obtain the best technical training to guarantee their success. That's why they have been writing in by the hundreds, many applying for registration; counting on training at Curtiss-Wright Tech just as soon as possible. They are going to get into aviation on the ground floor!

We pass this idea on to you because we sincerely believe it is a good one. Investigate! Send in the coupon! Know ahead of time what you want, and that you're going to get it! And be sure to let us know if we can help in any way.

Best wishes always,
Curtiss Wright Technical Institute



THIS TOWER OVERLOOKS AVIATION'S MOST DISTINGUISHED SCHOOL OF AERONAUTICS

CIVILIANS AND THOSE NOT QUALIFIED FOR ACTIVE SERVICE:
The same up-to-the-minute training so many are counting on after the war is available to you now—TODAY! Take full advantage of your opportunities to prepare for ratings in our Armed Forces and for a life-time civilian career in aviation. Don't Delay. Act! Now!!

CURTISS WRIGHT TECHNICAL INSTITUTE
Aim It Along

GRAND CENTRAL AIR TERMINAL
1225 AIRWAY, GLENDALE 1, CALIFORNIA
(LOS ANGELES COUNTY)

UNDER PERSONAL SUPERVISION OF MAJOR C. C. MOSELEY, PRESIDENT AND FOUNDER, SINCE 1929

BUY WAR BONDS

BE WISE—PROTECT YOUR FUTURE
MAIL TODAY • DON'T DELAY
WITHOUT COST OR OBLIGATION SEND ME FULL INFORMATION AND CATALOG ON THE COURSE CHECKED BELOW

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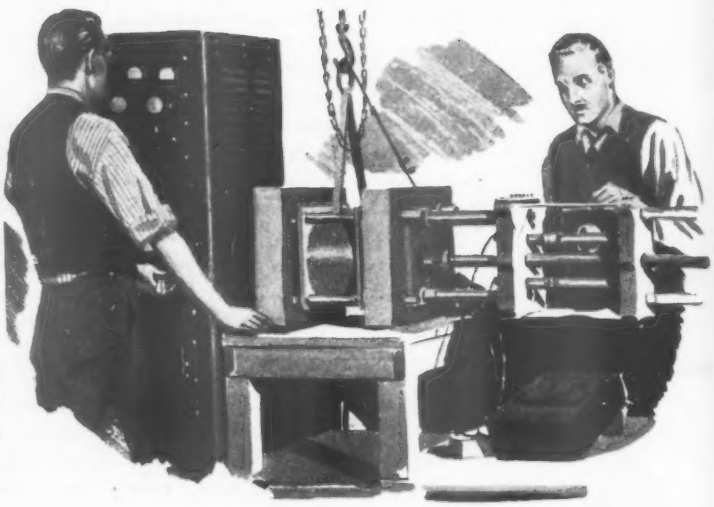
- ☐ MASTER AVIATION MECHANIC COURSE
- ☐ SPECIALIZED ENGINE COURSE
- ☐ SPECIALIZED AIRPLANE COURSE
- ☐ POST GRADUATE AERONAUTICAL ENGINEERING COURSE
- ☐ SPECIALIZED AIRCRAFT SHEET METAL COURSE
- ☐ AERONAUTICAL DRAFTING COURSE, HOME STUDY
- ☐ AIRCRAFT BLUE PRINT READING COURSE, HOME STUDY

NAME _____
ADDRESS _____
CITY _____ STATE _____
DATE OF BIRTH _____

F-5

Trail Blazing in the Skies

PIONEERING NEW METHODS



A SURER WAY TO MEASURE STRUCTURAL FATIGUE developed by the Goodyear Aircraft Corporation is the Resonance Fatigue-Testing machine. This ingenious device employs electric impulses to induce the natural vibration frequency of aircraft parts under simulated operating conditions, making it possible to determine fatigue characteristics with a high degree of accuracy. It can duplicate most types of fatigue, including alternating or pulsating stresses in structural parts made of steel, aluminum, or other alloys . . . whether they include riveted, brazed, or welded joints. Its utility is evidenced by its use in the U. S. Bureau of Standards.

HOW GOODYEAR AIRCRAFT CORPORATION SERVES THE AIRCRAFT INDUSTRY

1. *By constructing subassemblies to manufacturers' specifications.*
2. *By designing parts for all types of airplanes.*
3. *By re-engineering parts for mass production.*
4. *By building complete airplanes and airships.*
5. *By extending the facilities of Goodyear Research to aid the solution of any design or engineering problem.*

Goodyear Research Laboratory

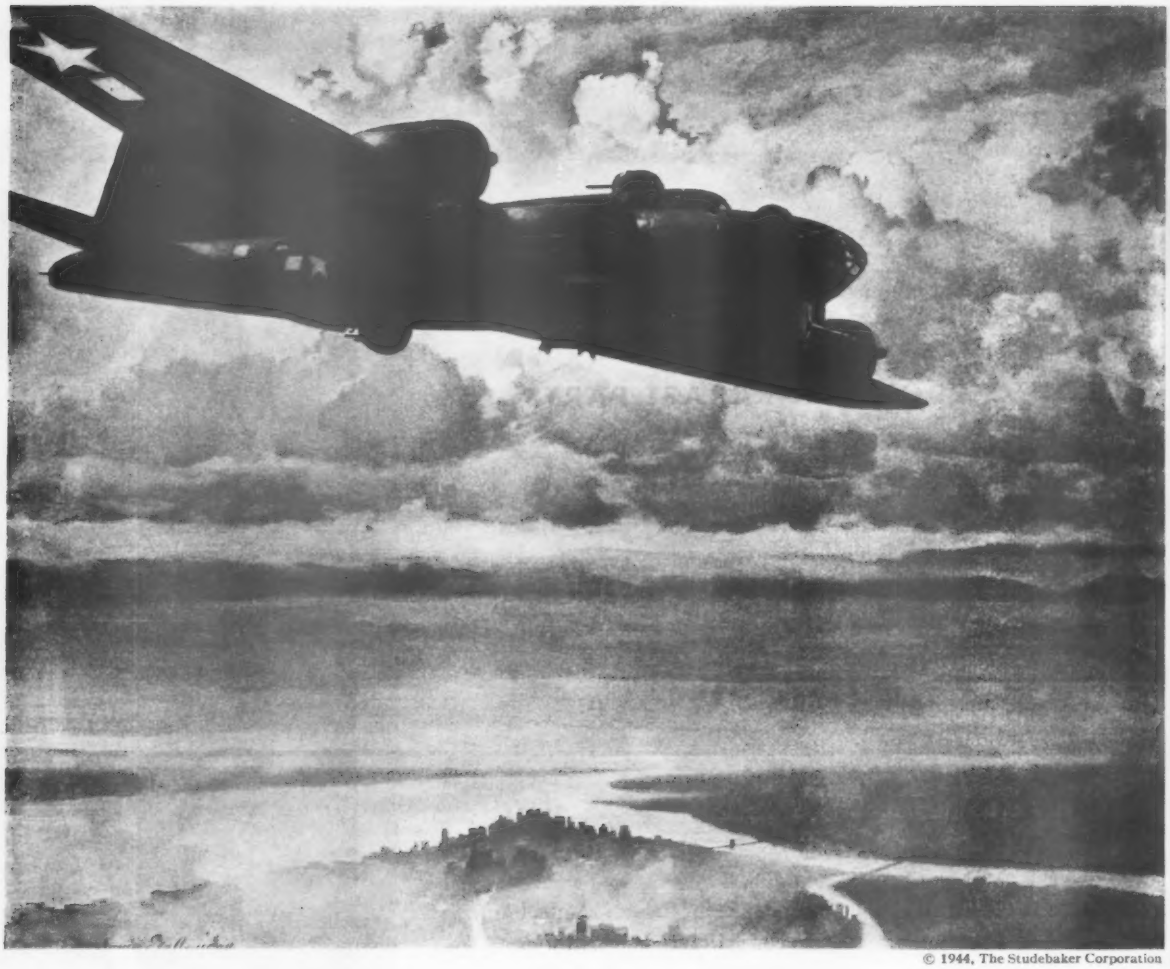
BUILDING PROVEN AIRCRAFT PARTS

THE DEADLY GRUMMAN AVENGER for which control surfaces have been built by Goodyear Aircraft Corporation. Thousands of Avengers now serving at the battlefront are equipped with Goodyear-built components and the great record of these ships bespeaks Goodyear's ability to meet the most exacting manufacturer's quality standard. This stems from Goodyear's 30-odd years' experience in aeronautics, a career notable for its many contributions to the improvement of aircraft. In addition to building subassemblies for many leading airplane manufacturers, Goodyear builds both complete airplanes and airships.

Let's all back the attack with **WAR BONDS**

GOODYEAR

GOODYEAR AIRCRAFT



© 1944, The Studebaker Corporation

"We all have faith in those engines!"

THE pilot of a Boeing Flying Fortress wrote the following about his bomber and the Studebaker-built Wright Cyclone engines that power it:

"I fly one every day and think there is no other ship her equal. We all have faith in those Cyclone engines."

Studebaker, famous for its peacetime motor cars and trucks, has already built tens of thousands of the mighty power plants with which the Flying Fortress has winged its way to world-wide victories.

But Studebaker realizes that this great four-engine Boeing bomber is merely part of an all-star team of other bombers, fighters, seaplanes, transports and observation planes that makes America's air might so effective.

All the valiant men and women of the Army, the Navy, the Air Forces, the Coast Guard and the Marine Corps know that the success of America's armed forces depends upon teamwork.

There is glory enough in decisive victory to give everyone who helps a share. And so Studebaker workers proudly and steadfastly keep on producing Wright Cyclone engines for the Boeing Flying Fortress—big, multiple-drive military trucks—and other vital war matériel.

Look ahead with Uncle Sam and buy more War Bonds now. Every Bond is a safeguard for the future . . . your country's future and your own.

Studebaker ***BUILDS WRIGHT CYCLONE ENGINES FOR THE BOEING FLYING FORTRESS***

View of General Metal Products Division of The General Tire & Rubber Co. Tail Wheel section castings in foreground. First step in machining section, in background.

General Tire goes all the way

TO GIVE YOU GENERAL'S FAMOUS TOP-QUALITY

Every finished tail wheel section is carefully inspected and checked and re-checked to make certain it meets rigid quality standards.

in Tail Wheels, Brakes and Main Landing Gear Wheels

Not only in tires and tubes but in the actual fabrication of wheels and brakes, as well, General Tire sees to it that the *Quality* is there. In its own metal products division, tail wheels, brakes and main landing gear wheels are built to rigid General Tire Top-Quality standards and up to A. A. F. specifications. In design—in manufacture—*in service*—General's products have proved their superiority. When you buy from General you are buying from the source that is known 'round the world for quality and safety—because *the performance is there.*

The GENERAL AIRPLANE TIRE

AVIATION DIVISION
THE GENERAL TIRE & RUBBER CO., AKRON, OHIO

PRECISION PAYS OFF IN PERFORMANCE

More than 50,000 Allison liquid-cooled aircraft engines have gone to the United Nations fighting forces. ★ Into each of these engines have gone the precision and skill amassed by Allison and General Motors during the past quarter of a century. ★ Therein lies the secret of the power of Allison engines and their reliable performance in every major engagement of our Army Air Forces.

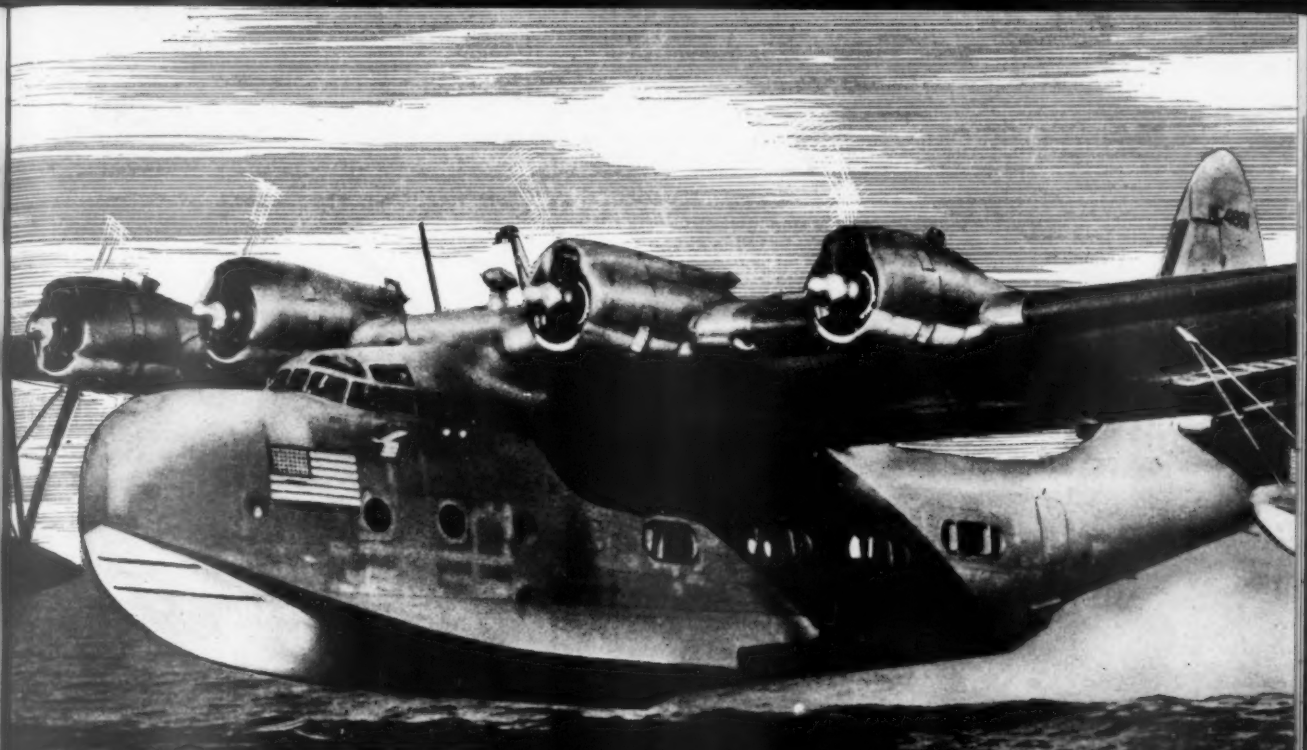
POWERED BY ALLISON:
P-38—Lightning
P-39—Airacobra
P-40—Warhawk
A-36 and P-51—Mustang

LIQUID-COOLED AIRCRAFT ENGINES

Allison
DIVISION OF GM GENERAL MOTORS

KEEP AMERICA STRONG
BUY WAR BONDS

Every Sunday Afternoon—GENERAL MOTORS SYMPHONY OF THE AIR—*NBC Network*



WANTED: [illegible],000 MILE AIRLINE IN A HURRY

On June 20, 1942, a 4-motored Vought-Sikorsky flying boat took off from Manhasset Bay headed for Foynes, Ireland, non-stop. It was the first of the fleet of transports of American Export Airlines. Behind that historic take-off were years of planning and experimental flights. Now the war was on, full blast. Our government had urgent work for the new airline.

Intensive pilot training was organized. A Link Trainer was installed...then another. In the Link, pilots carefully rehearsed approaches to faraway ports they had never seen. Among them was Bill Ehmer, veteran of a million miles of ocean flying.

By the end of 1943—18 short months after that first payload flight—American Export Airlines were operating a fleet of big flying boats in regular service to Europe...Africa...South America...11,574 route miles. Three hundred forty-three Atlantic crossings had been made.

That is the story of American Export Airlines...a story of American enterprise; know-how; the will to win! Link is very proud of its part in that story.

BILL EHMER, *Chief Link Instructor, charts a "let down" across the seas for the benefit of American Export pilots. Says Ehmer: "The Link has taken the 'mystery' out of long range flights, and has been a vital factor in the record our pilots have chalked up. All our pilot officers receive basic and regular refresher courses in the Link Trainer."*

LINK AVIATION DEVICES, INC.

Binghamton, New York

LINK MANUFACTURING COMPANY, LTD., GANANOQUE, ONTARIO

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LINK TRAINERS • AVIATION SEXTANTS • AND OTHER PRODUCTS CONTRIBUTING TO THE SAFETY OF FLIGHT

Cause —

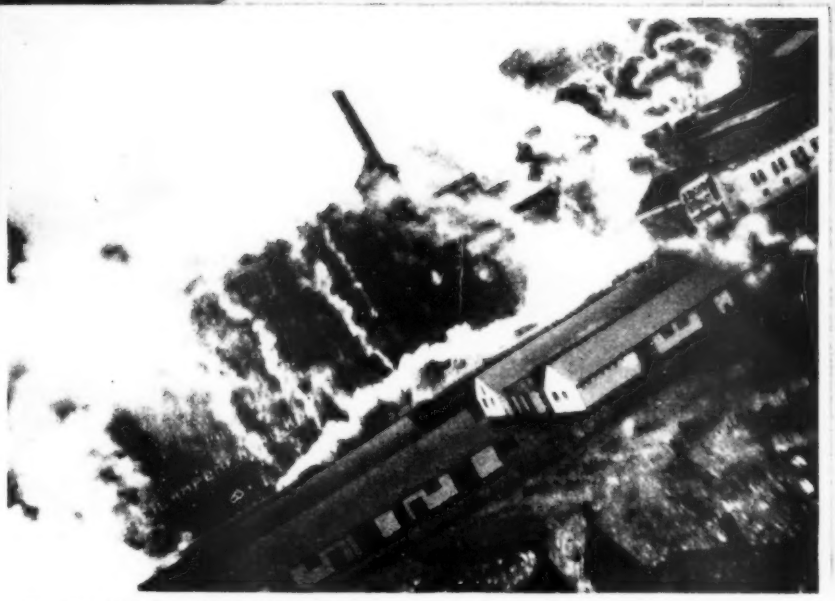
Mosquito

the fastest aircraft of its day — classed as the leading day and night reconnaissance-bomber, night intruder-fighter and bomber destroyer.

Designed and built by de Havilland, in peace time leading builders of transport aircraft in the British Empire.

DE HAVILLAND — In the attack tod

—and effect!



Daylight Attack on Philips Works, Eindhoven Mosquitoes are used for dangerous attacks on specific enemy objectives. This remarkable photo was taken during the attack by nearly 100 planes.

tod—on the trade routes of tomorrow

THE DE HAVILLAND AIRCRAFT OF CANADA, LTD.
TORONTO

RYAN-STANDARD cabin plane; pioneer passenger airliner.

RYAN BLUEBIRD, cabin monoplane, forerunner of "Spirit of St. Louis"

RYAN S-T metal-fuselaged primary trainer; led trend to low-wing types.

RYAN S-C, cabin plane for private-owner use, featured all-metal construction.

RYAN STM, first low-wing primary trainer types (PT-16 and PT-20) used by Army.

RYAN STM-S2 seaplane, exported for training Naval pilots.

RYAN PT-25, superbly engineered plastic-bonded plywood trainer.

Why *Ryan* Manifolds

ON SO MANY FAMOUS PLANES?

Back of Ryan's long position of leadership in the engineering and production of exhaust manifold systems is a different way of working—

A golf champion knows that how he hits the ball is mostly a matter of the "back swing" and the "follow thru".

Similarly, Ryan's enviable reputation for "hitting the ball" has resulted from a policy of encouraging design and engineering consultation *before* production and by following through *after* production with expert assistance on service problems and prompt and adequate parts supply.

Time and again it has been proven that Ryan can save its customers' money, weight and precious engineering time if Ryan engineers are called in for consultation with the customers' power plant experts and given the manifold design assignment when the original airplane design is being laid out. And besides these *savings* are the extra *benefits* of better performance and service characteristics.

Ryan engineering and production experts have demonstrated their leadership in the specialized field of manifold design and manufacture. Evidence of this is that Ryan technicians are responsible for what designers consider important development in manifold design in the past 15 years—the patented Ryan "ball and socket" universal joint, an essential to most modern power plant installations.

These are typical of the reasons why Ryan manifolds and other exhaust system applications are standard equipment on so many of America's most successful military and commercial planes.

If you have an exhaust systems problem we invite you to let Ryan apply its "know how" to it *in the designing stage.*

RYAN

Rely on Ryan to Build Well

RYAN BUILDS WELL

Ryan construction, proven in aviation's pioneer days, now proven in war, will tomorrow produce safer, more useful peacetime aircraft.

RYAN TRAINS WELL

Ryan School of Aeronautics, famous peacetime air school, now training fine U.S. Army pilots, follows one creed: **Thoroughness.**

RYAN PLANS WELL

Modern engineering + flying experience. Typical result: Ryan exhaust manifold systems are now used on the finest planes of other manufacturers.

RYAN AERONAUTICAL COMPANY — MEMBER, AIRCRAFT WAR PRODUCTION COUNCIL, INC.

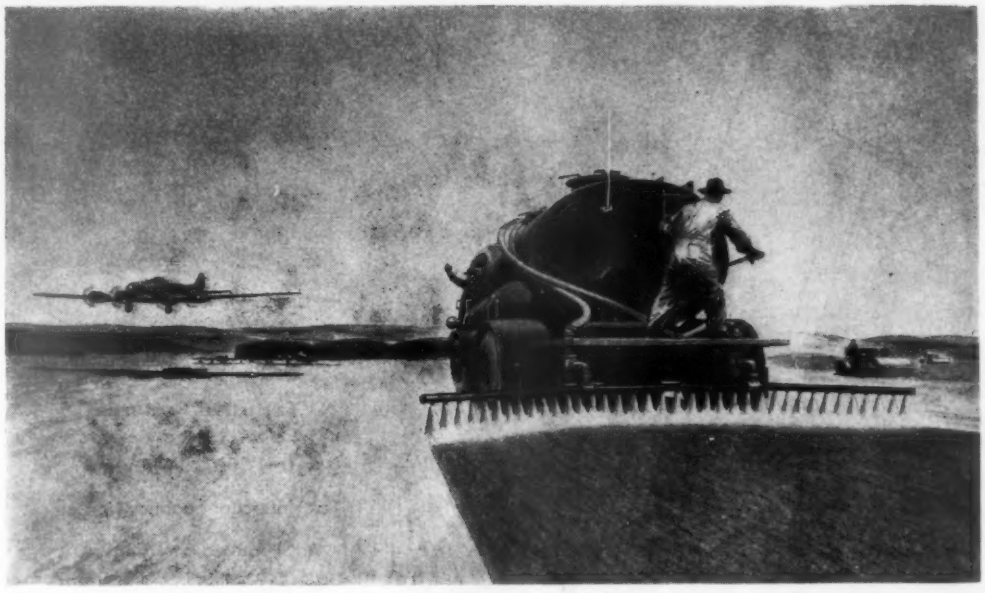
GENERAL OFFICES: LINDBERGH FIELD, SAN DIEGO — EASTERN OFFICES: 420 LEXINGTON AVE., NEW YORK

Ryan Products: Army PT-22s; Navy NR-1s; Army PT-25s; S-T Commercial and Military Trainers; Exhaust Manifold Systems and Bomber Assemblies.

Dust

IS CONTROLLED QUICKLY AND EFFECTIVELY WITH

GULF SANI-SOIL-SET



Why Gulf Sani-Soil-Set is the practical answer to YOUR dust-annoyance problems:

Highly Effective—Gulf Sani-Soil-Set completely eliminates dust annoyance immediately after application. No long waiting periods are necessary before the ground is ready for use. The dust allaying effect is accomplished by the action of the compound in adhering to and weighing down dust particles. In addition, Gulf Sani-Soil-Set possesses valuable germicidal properties.

Long Lasting—Because of its extremely low volatility and insolubility in water, Gulf Sani-Soil-Set remains effective for long periods. One application per season is usually sufficient.

Easily Applied—Gulf Sani-Soil-Set is free-flowing, easy and pleasant to use. It can be applied by sprinkling can or sprinkling truck, and spreads quickly and uniformly.

Saves Maintenance Expense—Gulf Sani-Soil-Set prevents the growth of grass on areas treated and reduces cleaning and dusting inside near-by buildings to a minimum.

Write today for the booklet giving complete information about this modern, proven dust allayer.

mail this coupon today

Gulf Oil Corporation · Gulf Refining Company F
3800 Gulf Building, Pittsburgh 30, Pa.

Please send me, without obligation, a copy of the booklet, "Gulf Sani-Soil-Set—the modern proven agent for controlling dust."

Name_____

Company_____

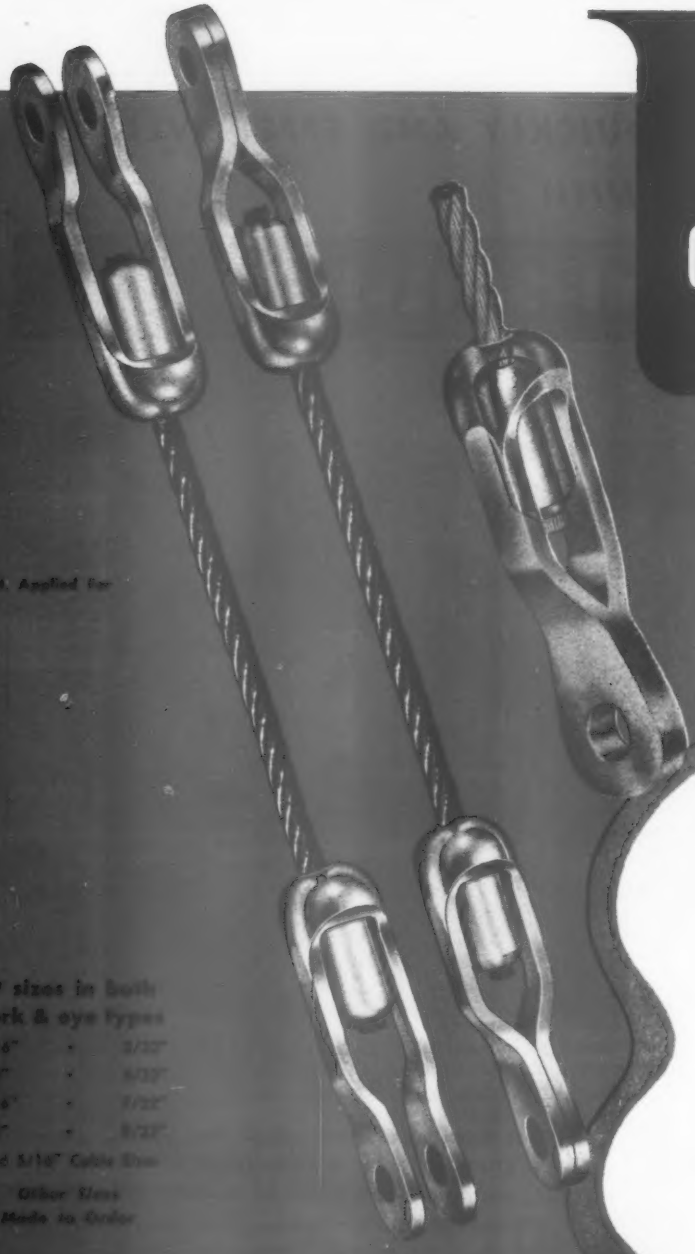
Title_____

Address_____

PN

Socketype

CABLE TERMINALS



Pat. Applied for

9 sizes in both fork & eye types

1/16" - 3/32"
1/8" - 5/32"
3/16" - 7/32"
1/4" - 9/32"
and 5/16" Cable Size

Other Sizes Made to Order

Exclusive Features

- ★ Low Cost
- ★ Interchangeability
- ★ Simplified Swaging
- ★ Speeds Cable Assembly
- ★ Saves 90% on Critical Material
- ★ No Engineering Change Necessary

Approved as interchangeable with B and C types of present standard AN 667 and 668

POULSEN & NARDON, INC.

Terminal Box 2398

LOS ANGELES 54, CALIF.

ARMY E NAVY

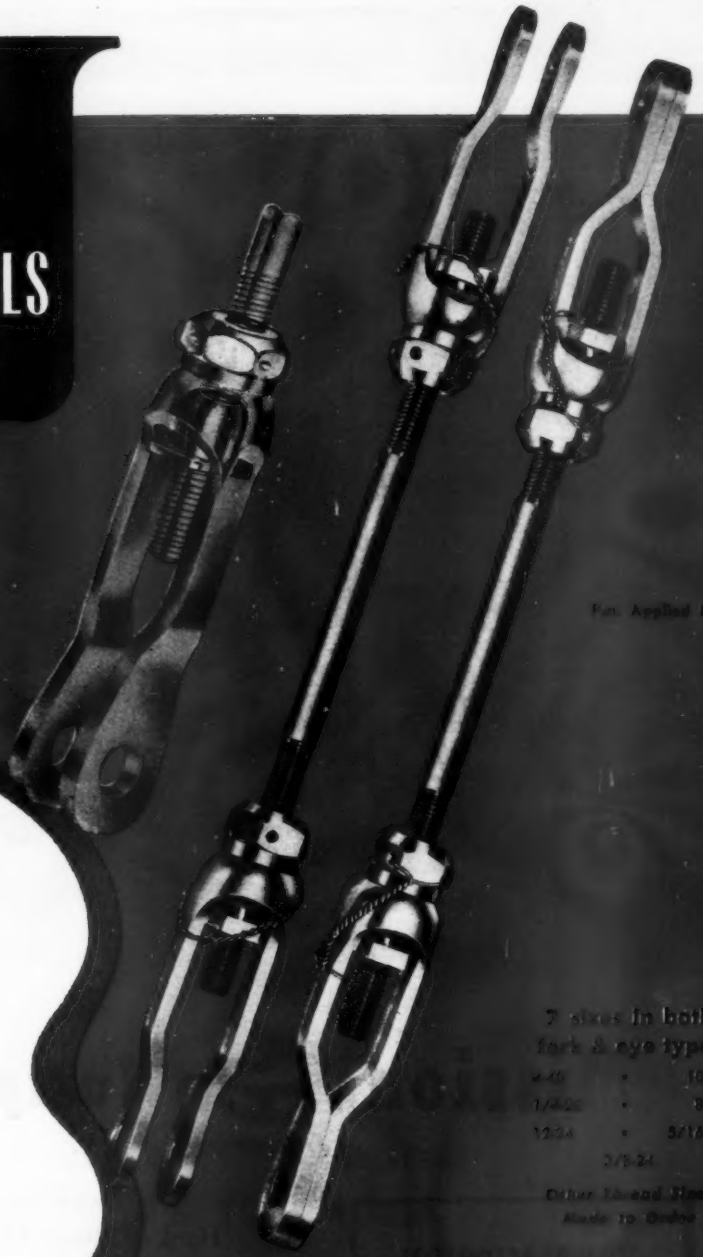
ESTABLISHED 1923

New Specification Sheet and Folder

PN

Socketnut

ROD END TERMINALS



Pat. Applied For

Exclusive Features

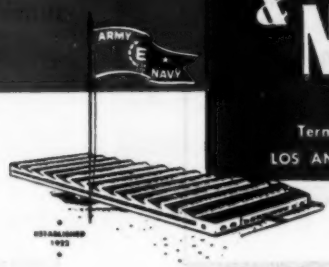
- ★ High Strength
- ★ Prompt Deliveries
- ★ Interchangeability
- ★ Reduced Service Stocks
- ★ No Tightening Distortion
- ★ Made of Non-Critical Material

Rods furnished on special order to customer's specifications

7 sizes in both fork & eye types

4-40	•	10-32
1/4-28	•	8-32
12-24	•	5/16-24
		3/8-24

Other Lengths and Sizes Made to Order



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LOS ANGELES 54, CALIF.

Available to Industry Personnel

OFFICIAL SIGNAL CORPS U. S. ARMY

Mission . . . To Jump and Occupy

YOUR MISSION

. . . is to team up with our fighting men and back their attack with your dollars.

Not until ALL military missions are accomplished will STANPAR civilian goods become available. Until then, "Wear it out, use it up, make it do" and

BUY MORE WAR BONDS

Soon they'll be off and over the objective. Then it's "Hook on! Ready! Go!!" So they descend for their valiant part in war's grim game — to seize and hold a strategic position or airfield.

STANPAR'S mission for the duration is to produce thousands of "parachutes with a pedigree"; to apply consummate skill in every stitch and seam.

Stanpar

STANDARD PARACHUTE CORPORATION SAN DIEGO, CALIFORNIA, U.S.A.

WE PUT OUR HEADS IN THE CLOUDS AND MADE RAINDROPS TO ORDER

Where do icing raindrops fall on a wing in flight? How do different speeds, wing sections, and raindrop sizes affect this pattern? That's what we wanted to find out. And this problem led to some very interesting raindrop research, conducted with the help of Daniel Guggenheim Airship Institute, Akron, Ohio.

First we poked our heads into the clouds... took them apart... assembled facts on raindrop sizes. Then we constructed wing section models, fixed one of them on a machine so it could be whirled at controllable speeds. Next we cemented sensitized paper onto the leading edge. Then we started things whirling.

Raindrops of one specific size were released at a fixed point in the rotation. By checking the sensitized paper, the raindrops were counted and their position plotted in relation to the leading edge. We did this again and again... with different speeds, raindrop sizes, wing angles, and airfoil surfaces.

The results are graphs that tell us the story of where freezing rain hits a wing, so that now we know how far back from the leading edge De-Icers should extend for adequate protection.

The B. F. Goodrich Co., Aeronautical Div., Akron, Ohio.

Skyway or Highway
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FIRST IN RUBBER
MAKERS OF MORE THAN 80 RUBBER AND SYNTHETIC RUBBER AVIATION PRODUCTS

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Leading formation, Beechcraft AT-10 advanced *pilot* trainer. Second, Beechcraft AT-7 (Navy SNB-2) *navigation* trainer. Third, Beechcraft AT-11 (Navy SNB-1) *bombing* trainer. The thousands of these Beechcrafts in use by the Armed Forces have played a dominant part in the training of bomber pilots, bombardiers, and navigators and have earned their excellent reputation by faithful and efficient performance.

COURSES COMPLETED BY TRAINING COMMAND STUDENTS
(as of 30 Nov. 43)

	1939	*1940*	*1941*	*1942*	*1943*	*Total*
Air crew	696	1,786	7,244	28,782	56,008	94,516
Pilots	...	44	601	4,477	13,783	18,905
Navigators	...	18	310	5,760	13,998	20,086
Bombardiers	...	...	...	25,820	81,398	107,218
Aerial gunners	...	...	198	2,325	18,850	21,373
Miscellaneous	...	...	...	273,068	513,333	786,401
Technicians	...	...	8,353	340,232	697,370	1,048,499
TOTAL	696	1,848				

A magnificent accomplishment is summarized in the figures quoted above. In only two years, the Training Command of the U. S. Army Air Forces has schooled virtually the entire personnel of the world's greatest air army. Its graduates are beyond doubt the best-trained airmen in all military history. The results of their training are apparent in every news dispatch that tells of bombing missions successfully completed, and of aerial combat scores predominantly favoring our air arms. Here is the sure forecast of our Victory . . . for Victory today must be won in the skies.

Beechcrafts are doing their part!

Beech Aircraft

CORPORATION

BUY U. S. WAR BONDS AND STAMPS — WICHITA, KANSAS, U. S. A.

AIR STRATEGY IN THE PACIFIC

Invasion barges move slowly toward Tarawa which planes and warships have left in flames. Valuable lessons in land-sea-air co-ordination were learned here.

The vast distances of the Pacific forced an air-sea-ground strategy that would prove equally effective in Europe, asserts the author.

☆

By Brig. Gen. HENRY J. REILLY, O.R.C.

BEFORE Pearl Harbor there was a persistent belief—frequently expressed by lay "experts", but not by the majority of military people—that a distant blockade imposed by the American fleet based on Hawaii and the British fleet based on Singapore could cut off enough of the raw materials necessary to Japan to force her to yield to our demands. Instead, within two and one-half months of their attack on Hawaii, the Japanese had possession of Singapore. Within six months they had occupied all the islands now in their possession, Malaya and Burma.

By military force, Japan not only obtained all the raw materials she needed for her economy but she denied to the United States and the British Empire a large part of the rubber and tin which they need. In addition, she had separated them so widely in the Pacific and Eastern Asia region that the shortest route from the American base which consists of this country, to the British Asiatic base which consists of India, is not via the Pacific as formerly but via the Atlantic, Mediterranean and the Indian Ocean.

To understand what our strategy must be to overcome Japan in the Pacific we must understand how Japan was able to accomplish this amazing coup in such a short period of time. Such a study discloses the mistakes of our foreign policy, the strategy we shall need and evidently are using to come to grips with Japan, and the vital necessity for our aviation to be used as part of a combined-land-sea-air force under a single commanding officer.

The whole question of Pacific strategy from the beginning has been the necessity to capture island bases from which our aviation could be used in attacking principal Japanese bases. Otherwise our warships and troop transports would have had to move to attack without aerial support against Japanese forces which always had it. This strategy in turn has resulted in the excellent practice of operating combined land-sea-air forces under a single commanding officer.

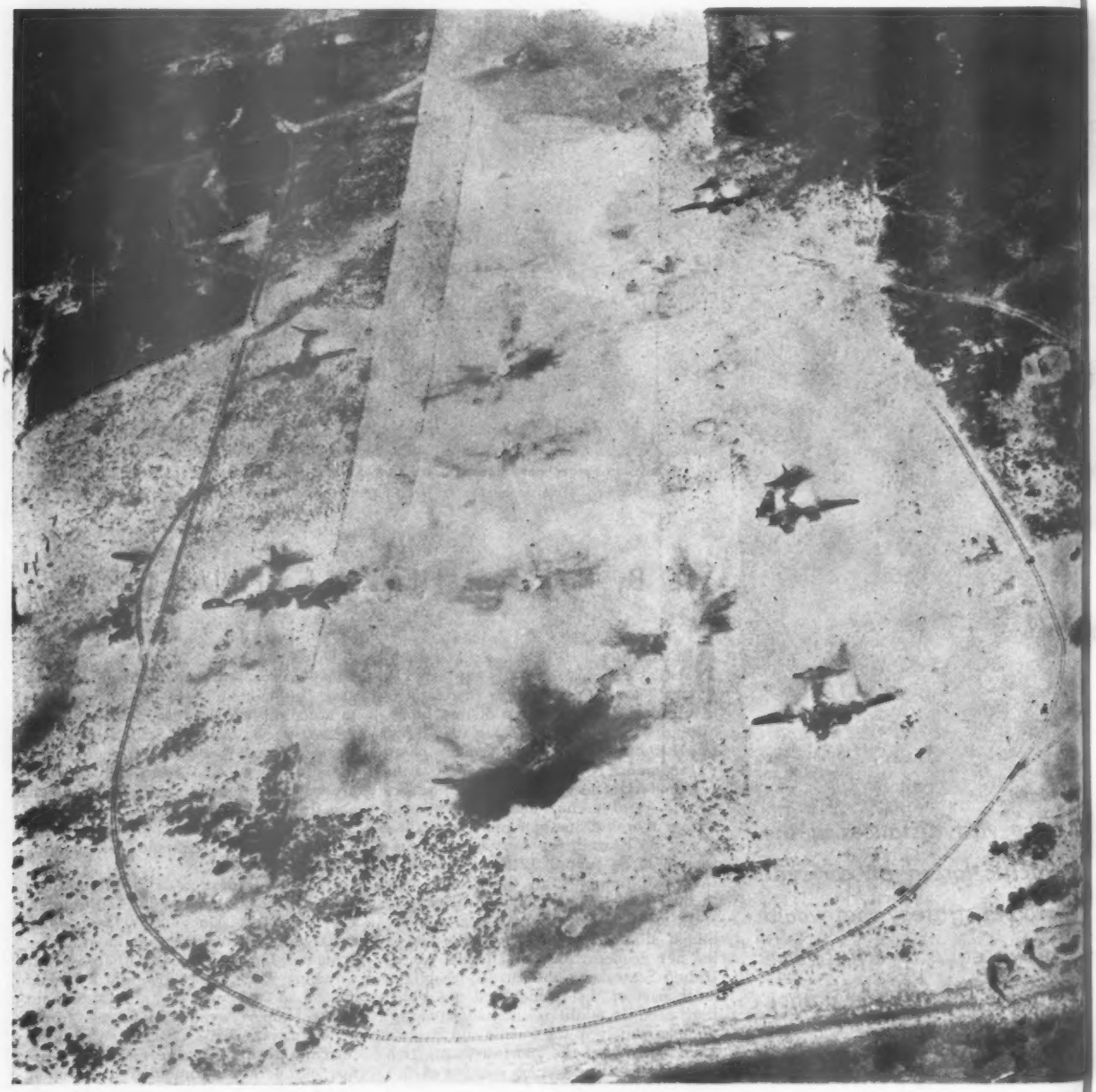
Our Pacific aviation has no base like Britain from which it can fly to acces-

sible enemy targets. Distances are so great that aviation cannot operate until new bases are captured from the enemy. The character of the air opposition met has also proved that the Navy operating alone cannot capture the enemy islands without air support. The numbers of enemy troops which have been met have made it clear that we must have Army troops to assist the landing forces. This will be even more rue when we attack Japan's main outer line—the rim of islands comprising the Japanese Islands, Formosa and the Philippine Islands.

Thus the greater distances of the Pacific have made clear what the shorter distances in the European theater of operations have not: that amphibious invasions must be combined operations under a single command. The Army cannot advance without the Navy. The Navy cannot seize islands without air cover and without assistance from the Army or Marines. Aviation cannot advance without the help of the Army and Navy to seize and hold bases. All must operate together.

Our present troubles in the Pacific go back to our lack of bases. While aviation is something new, there is no reason for our not understanding the necessity of air bases. When we were a great seafaring people and our clipper ships sailed all over the world we understood the need for bases. We knew that no ship could stay at sea all the time. We should know that the same is even more true of aircraft.

The various wars which we fought and in which our Navy was involved showed the need for bases. At the time of the Hawaiian revolution, primarily made by Americans, and the subsequent annexation of the Hawaiian Islands in 1898 (incidentally over the protest of Japan which has never been withdrawn), we knew that this group of islands was



Prime objective of carrier-based aircraft is to knock out enemy air power on the ground. W. Eugene Smith, FLYING'S photographer in the Pacific, made this striking photograph of seven Jap 'Betty' bombers smashed on the air strip on Engebi Island. Bombs first were dropped on the runway to prevent take-offs, then the planes were hit.

FLYING map visualizes the vast scale of the Pacific theatre compared with the Atlantic. Colored areas show relative positions of Europe and Africa to North and South America if New York were superimposed on Yokohama.

both a stepping stone to Asia and a position which we must hold if we did not want an enemy to use it as a base against our Pacific Coast.

At the time of the Hawaiian revolution the Japanese had a warship in Hawaii. They were planning to marry a Japanese prince to an Hawaiian princess or vice-versa as a means of bringing these islands under their control.

In his campaign for adequate American airpower, Billy Mitchell continually harped on the need for air bases throughout Alaska. When we went to war with Spain in 1898, Spain owned the Marshalls, Carolines, Marianas and the Palau Islands as well as the Philippines.

Until Spain lost Mexico in the early part of the 19th Century, the Spanish route from Spain to the Philippines was across the Atlantic to Cuba, thence to Vera Cruz, Mexico, thence overland by the Camino Real to Acapulco on the Pacific Coast where ship was again taken for the Philippines. The Pacific Islands gave her stepping stones all the way across.

And yet when we made our peace with Spain in 1899 at Paris, taking away Porto Rico, Guam and the Philippines, though she offered to throw these smaller islands in for nothing we said we did not want them. The ink was hardly dry on the treaty before Germany bought them from Spain. Germany knew the value of bases.

The only thing Japan did in the last World War when she was our ally was to take these islands away from Germany, besides the German navy base at Tsingtao on the peninsula of Shantung, China.

At the Versailles Peace Conference we did not insist that the heavy fighting we had done entitled us to some recompense and that we should be given these islands as natural stepping stones from Hawaii to the Philippines. In our hands they in no way constituted a threat to Japan because they were too far from her homeland.

But in her hands, because of their lack of commercial value, they could only mean that she wanted them for bases against us and against the British colonies and possessions in the South Pacific.

We only asked for the little island of Yap, a cable station, through which most of our business with China passes. We didn't even insist on that, with the result that it went to Japan.

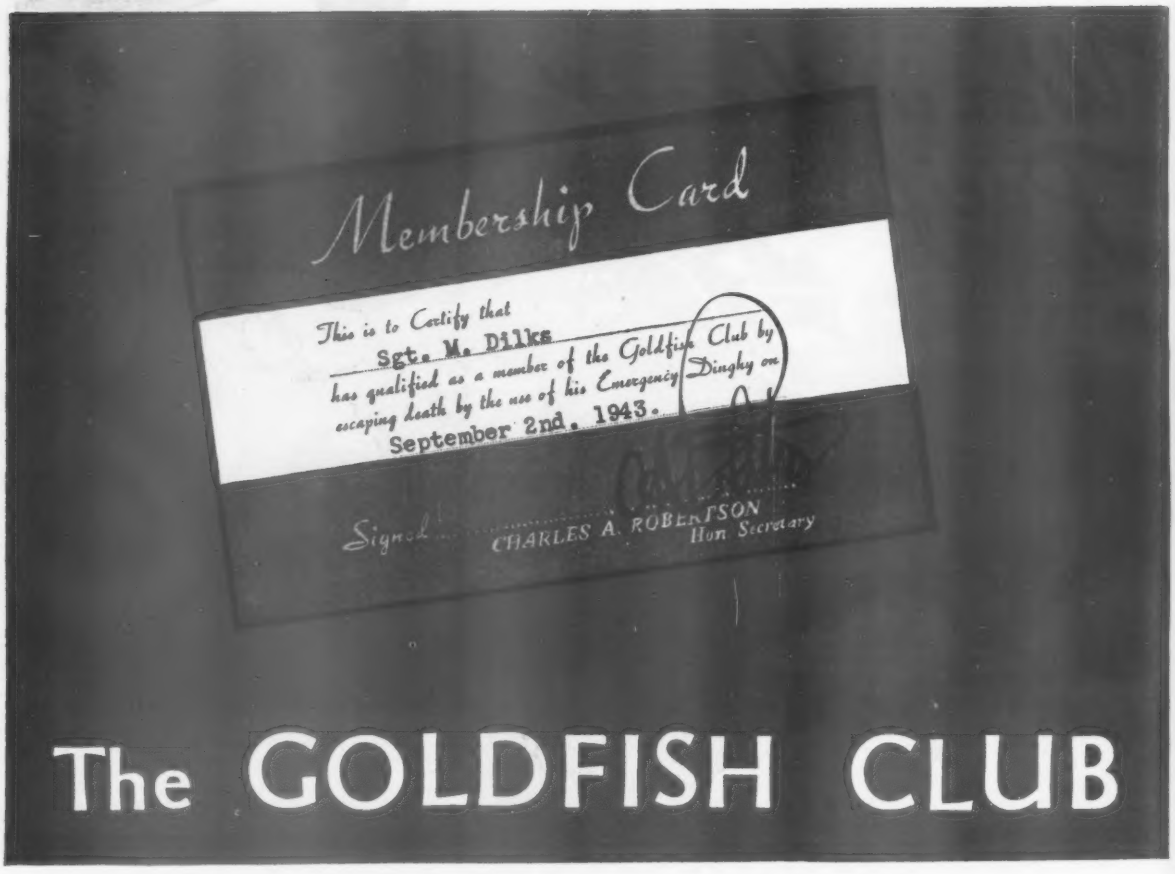
In 1925, when the author was stopping in Hawaii en route to the Orient, Admiral Moffet came in on the *Saratoga* or *Lexington*. As an old friend, I had a long talk with him on the aviation situation in the Pacific. He warned about the Japanese in the Marshall Islands, showing on a chart how the nearest of the Marshalls were several hundred miles closer to Hawaii than was San Francisco.

Later this warning was incorporated in the war plans for the defense of the Hawaiian Islands and was undoubtedly still there on the day of Pearl Harbor. There is little doubt that the Pearl Harbor attack came from the Marshalls.

For years the student officers at both the Army and Navy war colleges worked on the best way to bring relief to the Philippines in case of war with Japan. The greatest problem always was how to break through or get by these formerly Spanish islands between Hawaii and the Philippines which so easily could have been ours. No satisfactory answer was ever found because of our lack of Naval strength and inadequate air force, to say nothing of the troops needed to be carried along in transports.

The whole thing came down to the fact that what we could do would take so much time to organize and execute that the Japanese would have time to seize and garrison the Philippines. This is exactly what did happen.

(*Continued on page* 102)


Membership Card
This is to Certify that
Sgt. M. Dilks
has qualified as a member of the Goldfish Club by
escaping death by the use of his Emergency Dinghy on
September 2nd, 1943.
Signed
CHARLES A. ROBERTSON
Hon Secretary

The GOLDFISH CLUB

By A. SPENSER ALLBERRY

FLYING'S London Editorial Representative

The Caterpillar Club has its counterpart in an organization of Allied airmen whose lives have been saved by using inflatable rubber dinghys.

ONE of the mostly highly-prized possessions of RAF flyers and an increasing number of American airmen who have been forced down at sea and saved by their inflatable dinghies or Mae Wests is a small gold-colored waterproofed card certifying that the bearer "has qualified as a member of the Goldfish Club by escaping death by the use of his "emergency dinghy" on such and such a date, signed and certified by Charles A. Robertson, honorary secretary of the club.

Members of the club wear a small black cloth emblem on which is woven a golden fish bearing a large upswept white wing. If a member has been rescued more than once, a wavy blue bar can be worn under the original badge for each additional rescue. As a further consideration for his cheating Davy Jones, he may use the club's private note paper bearing the club crest.

Headquarters of the club are now in England. Readers who meet the necessary qualifications may obtain membership through FLYING magazine by submitting an affidavit stating the facts and countersigned by the airman's commanding officer. FLYING will forward the applications to club headquarters in the British Isles.

The Goldfish Club was founded by Lieut. Col. F. Baden-Powell Weil to commemorate the rescues of airmen who saved their lives by using an emergency dinghy. Lieutenant Colonel Weil is managing director of P. B. Cow & Co., manufacturers of air-sea rescue equipment. An inaugural broadcast describing the club and its purposes was made in January, 1943, by Mr. Robertson.

Free life membership in the club is given to those flying crew members who have saved their lives by using inflatable dinghies, either through baling out of an aircraft and using a single-seater attached to the flying suit or by ditching a bomber onto the sea and using a large bomber dinghy.

Other members are admitted to the club under special circumstances. For instance, a man who survives the ordeal of clinging to the wreckage of his aircraft after finding it impossible to use the dinghy, or who keeps himself afloat by using his Mae West life jacket, is entitled to an endorsed membership which may be terminated after a specified time, as distinct from the life membership. Membership is accompanied by the membership card, the cloth emblem or badge, and the club note paper.

Popularity of the club has swept through the Allied air forces and official membership lists now include members from Britain, Poland, Belgium, Australia, South Africa, Canada, United States, France, Norway, Czechoslovakia, Holland and New Zealand in addition to men from Eire and Sweden serving in the RAF.

Applications for British empire membership are now handled officially

Membership in the Goldfish Club is exclusive. These crew members of a Short Sunderland, climbing aboard a rescue boat after being shot down over the Bay of Biscay and drifting 24 hours in their dinghy, have qualified.

through the offices of the Commonwealth of Australia and the Dominion of Canada and others. Several high-ranking officers hold the position of patron, signifying their association and agreement with the principles of the club.

Plans are now under way to perpetuate the club in the post-war years. Hundreds of members have requested an annual post-war reunion. Plans are also agreed upon to set up a permanent club in the West End of London. A permanent Canadian club also has been proposed, and if sufficient members of American airmen join there will undoubtedly be a permanent U. S. organization.

Letters of application are received from every war theater. They are countersigned by the member's commanding officer as a guarantee of accuracy. Applications were received within a few days of the invasion of Italy by aviators who crashed into the sea during the air battles which took place at that time. If applications come from military hospitals, the club secretary also sends the airmen a number of books to relieve their boredom.

Official membership of the club is secret for military reasons, but it has been announced that more than 250 airmen prisoners of war in Germany are members, many of them American. All these members have applied direct from their camps in Germany.

Secretary Robertson planned a bronze medallion for members when the club was being organized, but since this involved the use of strategic materials and skilled labor the British Ministry of Supply banned the use of the medallion. The

The Goldfish Club insigne. Wavy bars indicate additional rescues.

problem was ultimately solved by Mr. Robertson's own staff in the drawing and design office of P. B. Cow, who gave their own dress suits to be cut up into the small black cloth badges which now go to airmen all over the world. This source of supply, supplemented by other generous donors, has provided members with the Goldfish Club badge of today.

Often, when a bomber crew has crashed and been saved by its dinghy, the club emblem has been adopted as the official crest of the crew's new plane. A captain of an air-sea rescue launch recently pointed out that, though he could not apply for club membership, he believed that his boat, which has saved so many airmen from the sea, should certainly be associated with the club in some way.

He suggested that the club supply a carved crest to be fixed to the bridge of the boat. The club has since done this.

Letters are frequently received containing applications on behalf of deceased airmen from their parents, wives and sweethearts. Airmen on leave visit the honorary secretary and the factory making the equipment which saved their lives.

Indicative of the importance of the Goldfish Club is the fact that the London Imperial War Museum and the Australian War Museum have obtained full details of the club, together with specimen membership cards and the club badge. Several other Allied governments are considering the club's emblems and data for exhibition as post-war records in their own country's museums. END

AIRLINES AT WAR

Fewer planes carry more passengers as the airlines revise their schedules and streamline operations.

By EDITH M. STERN

IT WAS impossible—but they did it. The war took nearly half their planes; yet they are carrying more passengers and twice the load of goods with no loss of safety. America's airlines have broken production bottlenecks by speedy deliveries of critical materials or parts. They have changed the course of history by getting the right people to the right places all over the world at the right time.

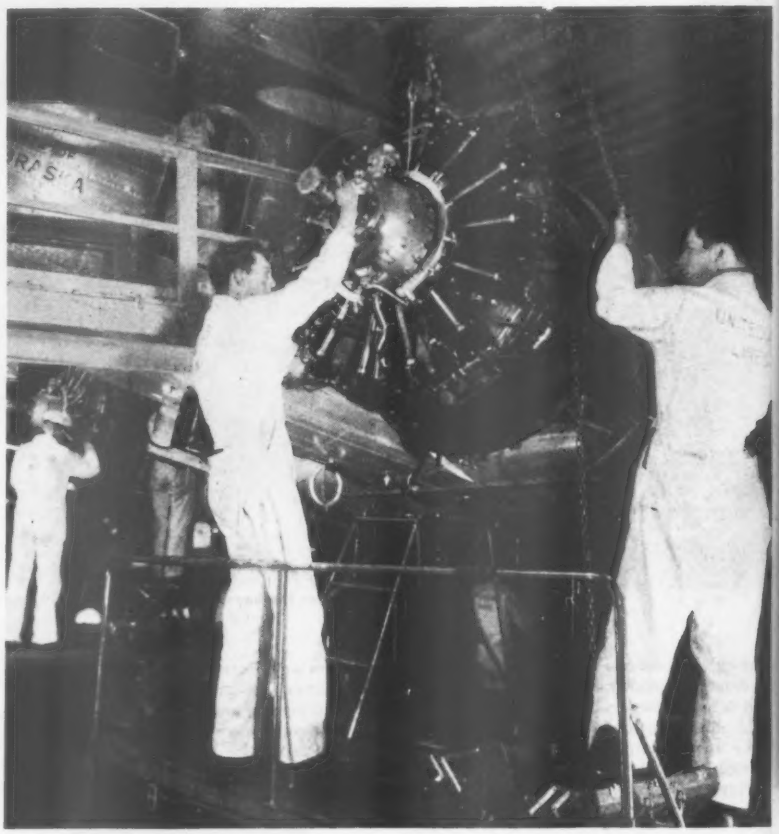
How, is one of those miracles of ingenuity in detail. Most of it was improvisation but some of the improvisation is here to stay. It will keep post-war air travel more efficient, make it cheaper, and move it from the exclusively drawing-room-in-a-Pullman class right into the day coaches.

As long ago as 1936, the air transport industry filed carefully laid plans for its mobilization in case of war. When Pearl Harbor was bombed, however, most of these had to be scrapped, for they were based on a full complement of planes. Before the middle of December, 1941, the airlines had to move troops to places still undisclosed. They never did get their planes back.

So successfully have the airlines done more with less that they have been carrying over twice as much cargo, over half again as much mail, and two per cent more passengers. With only 195 planes left today out of 352, revenue passenger miles flown in 1943 topped 1941 by 230,415,769; express increased by an estimated 37,926,329 pounds; air mail pieces carried jumped more than 510,686,000. The answer to such mathematics came bit by bit, invention by invention; each plane spends more time in the air, flying 16 to 18 hours a day as against a pre-war average of 11½.

Schedule revision was first. Back in the old luxurious, wasteful days before Pearl Harbor, passengers' convenience determined timetables. Runs between such places as New York and Washington were on virtually commuting schedules. The Five o'clock business men's delight filled up; other planes might fly half empty. During unpopular off hours planes stayed idle on the ground for an average of 10 hours, often as long as 12 to 14.

Today all that is changed. New York-Washington runs have been cut from 80 to 20 a day. "Turn arounds," the interims between the end of one run and the beginning of the next, have been reduced by half or two-thirds. Ships start their runs earlier in the day and finish them later. The average layover has been decreased to six hours.



Almost before engines are cool, crews on movable platforms start overhaul work.

Non-stop flights are out for the duration. A New York to Chicago non-stop run loads a plane with 2,400 pounds of gasoline. With two stops, only 800 pounds need be carried at a time and the difference is gained by equivalent poundage in freight or by almost four more passengers. What's more, important war centers are getting better service.

War necessity is the mother of gadgets that accelerate routine "line" maintenance. Mechanics travel about the field and from shop to shop in scooters. Big trailers attached to gas trucks haul huge additional quantities of fuel and make shuttling for replenishment unnecessary. Oil tanks are drained and filled in half the pre-war time. The hand-pushed oil cart, the hand-operated pump and the ladder that went with them have become as obsolete as the horse-drawn hook and ladder fire-wagon. Now a single motorized unit carries oil, automatic draining and pumping mechanism, and an adjustable platform.

Today six men work on engines simultaneously where only one worked before and not one of them loses time toting and setting up a ladder. In one of the American Airlines' maintenance shops I saw the movable platform that effects this sixfold speed-up. It is designed to completely surround the engine. Its top platform was densely populated by mechanics.

Pan American has devised a three-story platform with a well-equipped workshop on top. Even waste rags go down a built-in chute. When a Pan American plane lands, these days, it doesn't wait idly in the water until there's room for it in the hangar. Mechanics

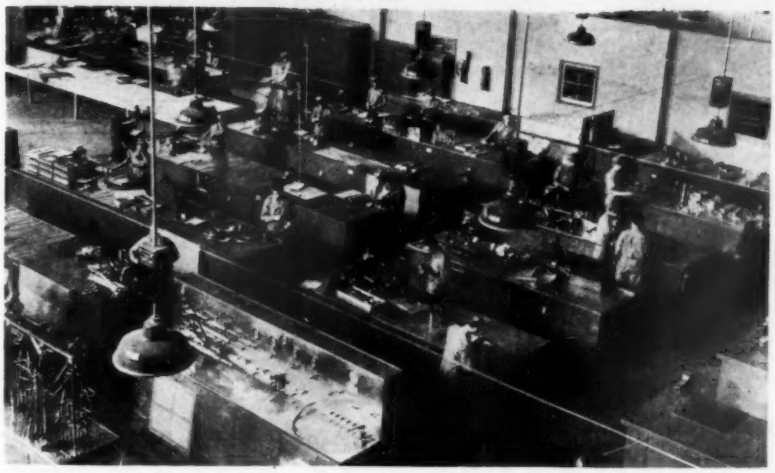
Crowded air routes contribute to record load factors these days, while essential passengers travel on priorities.

hurry down to the dock and amphibious servicing saves several vital hours. With pilots accompanying maintenance crews, final pre-departure flight tests that used to be made with instruments in the shop are made up in the air.

Former personnel "musts" have also been modified. Five years before Pearl Harbor, American Airlines considered a four-year training course necessary for its mechanics. When the war clouds began to gather, the company reluctantly shortened its course to three years. Then came war and the draft. Of the 135 men in training, staggered to be graduated eight or 10 at a time, only 20 remained.

American had to renounce its peacetime aim of the mechanic who knows each wrinkle of planes and engines better than he knows his own mother and who can do anything from cleaning a spark plug to measuring the 1/10,000th

(*Continued on page* 95)



American Airlines overhaul shop at La Guardia Field keeps planes on close schedules.

POST-WAR PRIVATE PLANES

By WILLIAM D. HALL

Chief Engineer, Aeronca Aircraft Corporation

Improved performance but little change in design is the immediate outlook, declares lightplane authority.

REASONABLY soon after the termination of the war, you will have a choice of aircraft for your private use which will be vastly superior to what you have been accustomed to in the past. Although immediate wartime developments have not been concerned with the private type aircraft, the explosive rate at which the aircraft industry has progressed has brought to light many improvements which will be applied to the private airplane. These developments, together with those occurring naturally in a field with intense competition will be bound to result in a number of excellent models from which the public can choose.

Today we are able to do only a limited amount of development on the future's aircraft. Hence, the immediate post-war market will be supplied with planes which are identical or slightly modified from those offered in 1940 and early 1941.

The author (center) and Aeronca associates check wind tunnel test of scale model.

Although these planes can take many forms, the important ones are the "fixed wing" type, and the "rotating wing" type such as the helicopter. Although considerable publicity has been given the recent advances of the helicopter, the author feels that it is still a long way from offering the best compromise from the standpoint of the private owner and that the fixed wing type will dominate the immediate future. Therefore, the remainder of this discussion is pertinent primarily to the fixed wing type plane.

The following types, at least, will be offered to the post-war public:

1. A low-powered, inexpensive training type aircraft, with either tandem or side-by-side seating arrangement, which will be a refined version of the pre-war light airplane models. This airplane will sell at approximately $1,000 and, in order to meet this cost, will consist of the minimum amount of aircraft that will fly satisfactorily.

2. A medium-priced, medium-performance type aircraft which will be supersafe and aimed at the private owner, and will be available in two-place and four- or five-place models. The two-place version will list at approximately $1,500 and the larger planes at approximately $3,000. The performance of this type of plane will be compromised to some extent to obtain maximum safety and comfort. As the development and tooling costs of this type of aircraft are amortized the price will move downward, but probably will not reach the desirable $1,000 level for the two-place, or the desirable $2,000 level for the larger planes for some time.

3. An aircraft combining as high performance as consistent with reasonable safety, comfort and cost will be available at approximately $2,000. This aircraft will be a "cleaned up" version of the pre-war two-place, side-by-side, low wing, retractible gear type and will be offered for those persons who will demand maximum performance.

The standards of design in acceptance heretofore in private aircraft will be superseded by much higher ones, as it is only by these higher standards that the

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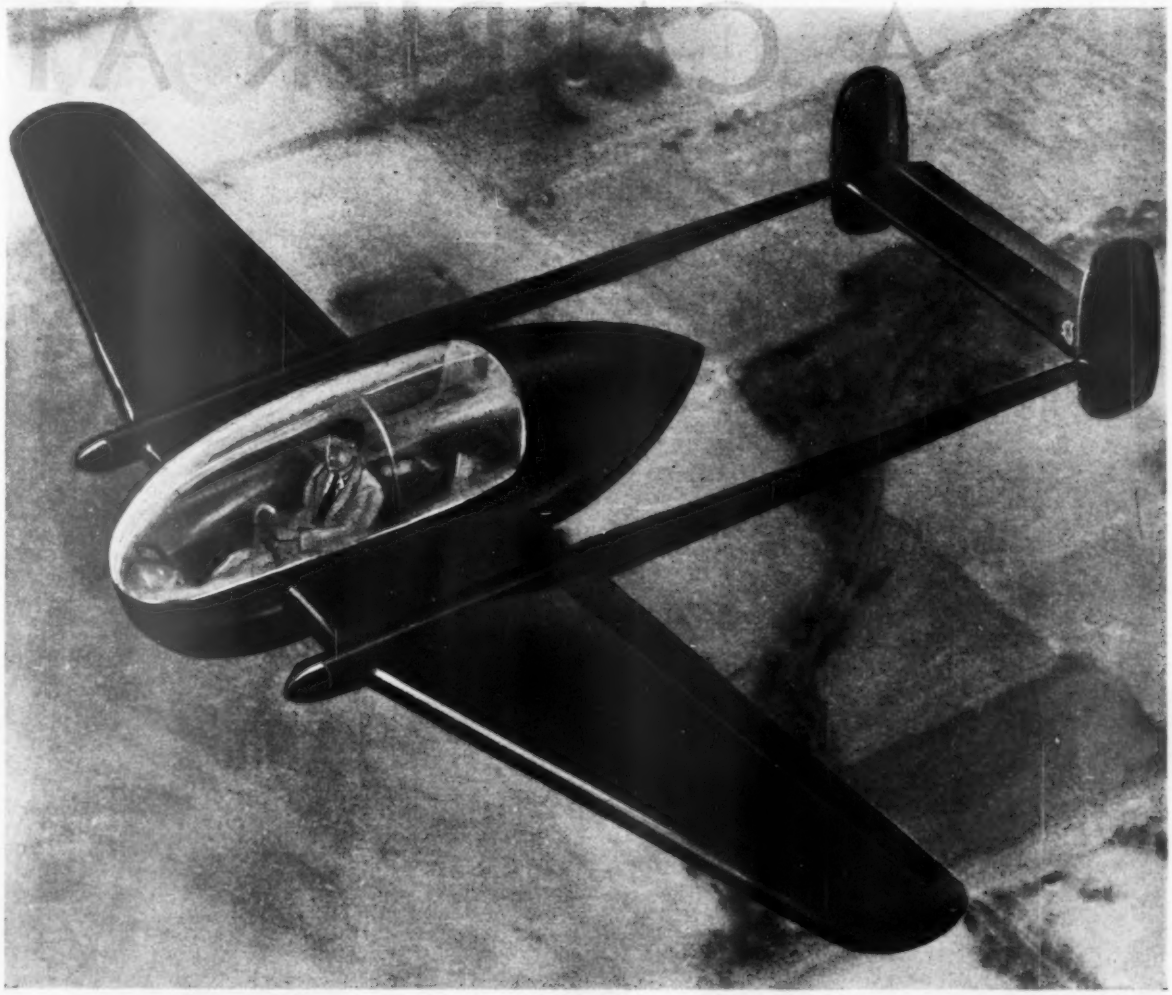


Influence of Lockheed Lightning predominates in this idea for post-war design with two 75-h.p. internal combustion turbines, as conceived by Aeronca artist. Mr. Hall emphasizes that such revolutionary private planes are many years away.

inherent difficulties of the aircraft will be minimized to the point where the average person can easily operate one. The ideal airplane will be that one which is the best compromise between safety, cost, performance, dependability and comfort, for the purpose for which it is intended.

Before any one will accept something new, he satisfies himself that neither he nor his family will encounter any greater risks than he is used to. Therefore it will be necessary to develop airplanes so that the public will feel no more uncomfortable in them, as far as personal hazards go, than when it is in its automobiles or bathtubs.

Because aircraft operate in a three-dimensional medium, man—who is a two-dimensional creature by heredity—finds there are a greater number of natural hazards than he is accustomed to with surface vehicles. A student pilot has to be continually reminded to control the altitude of the airplane, as well as the direction and attitude, since he is used to controlling only his direction. Further, the student is beset with the fact that the conventional type aircraft is controllable and stable only within a very limited range of possible attitudes into which it can be placed. Hence he must be trained very carefully to stay within these limitations.

This problem offers two pure solutions: one to rigorously train the pilot, the other to modify the airplane so that it automatically keeps the operator out of trouble. The first solution has prevailed to date due to the limited knowledge of the designers, although it is not the best answer. The second solution is desirable but of an Utopian nature, and hence is the one we wish to strive for although possibly we will never reach it completely.

The primary form of loss of control and stability is the stall followed by the spin. Statistics of the Civil Aeronautics Administration show that the majority of accidents have occurred from loss of control in the form of a stall when the aircraft is close to the ground. At least a partial solution was well under way in immediate pre-war aircraft in the form of spin-proof or spin-resistant designs. We can expect further refinements of this type to be available.

The non-spinning characteristics of the future will probably be accomplished, as they were in the past, by the following means: the wing proper will be designed so that it stalls gradually with the stall originating over the center portion of the wing and the ailerons used will not stall the remainder of the wing when they are deflected to obtain lateral control. Further longitudinal control will be limited so that it will be impossible to place the airplane in a complete stall position without a dive and a violent pull-up. Also, an automatic warning of the impending stall, in the form of tail buffeting, or perhaps an instrument on the dash board, will be included for the benefit of the individual who might occasionally become careless.

The person who takes up flying finds that it is very difficult to co-ordinate the use of the rudder and the aileron. Most

(*Continued on page* 108)

A CARRIER AT

ONE OF THE NAVY'S giant combat carriers cruises ahead of the carrier on which FLYING's photographer was stationed. These carriers were part of a task force that attacked Jap bases like Tarawa, Kwajalein and Truk so successfully. Guns in foreground are 40-mm. antiaircraft.

WORK ☆ ☆ ☆

AIRCRAFT carriers have proved themselves to be among the most potent offensive naval weapons. If the record of U. S. Navy carriers to date is any criterion, the carrier is the most powerful weapon afloat. W. Eugene Smith, FLYING's combat photographer in the Pacific, has been aboard one of these carriers for nearly all of the past six months. He has photographed his carrier on routine operations and he has photographed it in battle.

Many of Smith's aerial battle pictures were so good that the Navy ordered them distributed to all picture syndicates in the United States as are official Navy photographs. One such picture was that of the crash in which Columnist Raymond Clapper was killed. Several of Smith's aerial combat photos of the raid on Tinian Island (one is on page 39) were used by newspapers and magazines throughout the world.

The photographs on these and the following pages are some of the best showing Smith's carrier at work. They show the routine, every-day activity aboard, as well as some of the actual fighting. Three combat missions are represented: Tarawa, Engebi Island and Tinian. On each of these, Smith flew with the attacking squadrons, mostly in a Grumman *Avenger*. When he left the States he had six cameras, a whole battery of special lenses, film and flash bulbs; all the cameras were damaged in combat.

W. Eugene Smith

THE CARRIER'S SKIPPER (closest to the camera) directs the morning's preparations for operations. This section of the "island" is "primary flight."

AEROLOGY data are collected periodically. Direction and speed of balloon indicates winds at various altitudes.

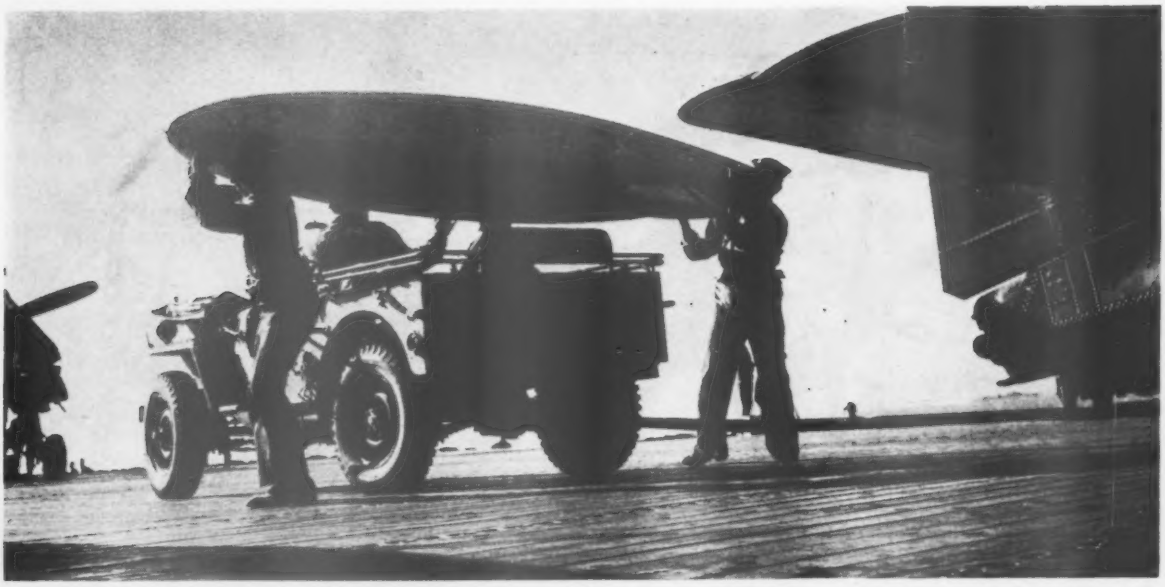
BEFORE THE DAY'S FLYING starts, accumulated layers of oil and grit are scrubbed off the flight deck. Hellcat fighters on deck stand ready at all hours, their engines warmed for emergency take-off. In background, wings folded, is Helldiver.

LONG-AWAITED MAIL comes aboard the carrier in a breeches buoy from a destroyer. Both ships hold speed while tied together.

FLYERS AND SAILORS have waited weeks for this. Smith says ship is in excellent humor for days after receiving mail from home.

PLENTY OF EXERCISE is available. This game, known as "Commando Tennis", is played on the flight deck, as is baseball and football. Sunbathing also is very popular. Note another large carrier on the horizon, between the second and third men from the right.

RELAXATION is had on the flight deck, where the carrier's band plays, amateur actors perform and the chaplain wishes everyone godspeed on the coming mission. Airmen and deck crews sit together. Note shoulder holsters.



HELLCAT BELLY TANKS are brought up from the hangar deck on a jeep and installed on each fighter that will go on this long mission. These tanks hook on between landing wheels. Once in combat, pilot drops belly tank and flies on main fuel supply.

COCKPIT HATCHES are inspected and repaired in the machine shop when necessary. This one belongs to a Helldiver. Plexiglas, damaged in previous operation, has been replaced. Rectangular strip on outside deflects airstream for gunner.

THOUSAND-POUNDERS lined up on the flight deck, prior to loading aboard Avengers and Helldivers. Carrier crewmen vie for the honor of chalking the most original insults to Hirohito & Co. on the bombs. Two guns and the carrier's "island" are in background.

READY FOR THE DAY'S WORK, this Helldiver has just been lifted to the flight deck by an elevator. A 1,000-pound bomb is being trundled to its open bomb bay. The men at far left are carrying a belly fuel tank for a Hellcat.

A FOREST of whirling propellers, this squadron of Hellcats awaits the take-off signal. As each plane taxis to take off, the wings are unfolded and locked. Deck crewmen are experts at crawling and dodging around propellers.

DIVE BOMBERS take off next. This Helldiver's pilot has lowered his flaps, locked the brakes and is revving up the engine as a signal officer waves him down the deck. Four guns are in wings, bombs in fuselage.

DIVE BOMBERS take off next. This Helldiver's pilot has lowered his flaps, locked the brakes and is revving up the engine as a signal officer waves him down the deck. Four guns are in wings, bombs in fuselage.

TINIAN ISLAND The carrier's Avengers and Helldivers caught this air base by surprise and smashed all its planes on the ground. Note the crop-bearing fields and the large number of permanent buildings on this island.

HAVING BOMBED and strafed Tarawa without loss to themselves, the Helldivers return to the carrier. The plane in the air has just been waved off while Helldiver on deck taxis off arresting gear.

SAFELY ABOARD, this Helldiver's wings are quickly folded and the deck crew pushes it forward to the elevator that will take it below deck. There, the carrier's elaborate maintenance organization fully checks each plane.

VICTOR AND VANQUISHED. One of the carrier's airmen, ashore at Tarawa, looks over a Jap Zero that was smashed by American bombs on the ground. First objective of U. S. airmen always is to wreck Jap air power and its bases.

☆

'ULTRA-HIGH' on the AIRWAYS

By FRED HAMLIN
FLYING'S Washington Editor

Change-over to ultra-high frequency radio range will have many advantages.

COINCIDENT with the Army's release of necessary equipment, ultra-high frequency radio now will begin to supplant low-frequency equipment for transport use on the nation's airways.

The change-over is "the most important forward step since radio took to the airways" in the opinion of Thomas B. Bourne, Director of Federal Airways for the Civil Aeronautics Administration, chief mover in ultra-high development for aviation. Mr. Bourne and Donald M. Stuart, chief of the technical development division of CAA, cite among UHF advantages the fact that thunderstorm static will be eliminated, precipitation static will be reduced if not eliminated, UHF operates in a much less crowded frequency spectrum—away from marine beacons, airway radio aids, ranges, and Army and Navy training units—and that it will give better course definitions and have fewer multiple courses.

The last bottleneck toward conversion —need of ultra-high sets for planes— was broken recently when the Army notified CAA and the airlines that approximately 400 sets soon would be available.

Work toward ultra-high has been going on experimentally at CAA since October, 1937, with private industry co-operating in a big way. The impending change-over was being seriously considered by Charles I. Stanton, CAA administrator, about the time the war broke out and put war priorities on everything required for such a move. Now that things are loosening up, CAA experts are raising their sights toward hitting the problem of a light, inexpensive ultra-high unit for lightplanes. In the meantime, change-over plans include servicing low-frequency lightplane pilots.

Incidentally, it has been generally believed that Americans invented the words for UHF and that the British changed it to V (for veddy) HF. This isn't true, as

(*Continued on page* 160)

Ultra-high frequency radio range stations will soon dot airways.

BOMBING

BEFORE Aerial photo which revealed the artificial rubber plant at Huls. AAF's bomber raid was planned from this picture.

By

HENDRY L. BART

FLYING'S New York Editorial Representative

✶

Unarmed photo reconnaissance flyers must combine the very best qualities of fighter and bomber pilots to complete their missions.

✶

PHOTOGRAPHIC reconnaissance operations until recently were carefully guarded secrets and little was known by the public about the important role they play in our armed forces' strategic and tactical planning. We are continually hearing about land power, sea power, manpower, and air power, but few realize that these great powers cannot be most effectively and efficiently employed without photographic reconnaissance, which furnishes from 75 to 100 per cent of everything the Allies know about their enemies' military and commercial activities.

Photo reconnaissance pilots, with their lightning-fast aircraft equipped with batteries of cameras, have been referred to as aerial spies, Mata Haris with glass eyes, thieves of enemy secrets. Actually, they are the eyes of the armed forces. Through the photographs they take our tactical and strategic planners are able to search out facts about the enemy which could not possibly be obtained elsewhere.

The one-man photo reconnaissance and mapping crews (the lone member in each plane must be his own pilot, navigator, radio operator and photographer) are the outstanding airmen of this war. "The photo reconnaissance pilot must combine all the best qualifications of the fighter pilot and the bomber pilot", is the way Col. James G. Hall, chief of the AAF's reconnaissance branch, puts it.

"He needs the former because he must make split-second decisions in fending off attacks by enemy fighter pilots. And he must have the bomber pilot's persistence and steadiness for, like him, he has a mission to perform; he must get his photographs and bring them back, no matter what the interference.

"He must run his own radio, of course. Add to that the fact that on virtually every mission he's out of friendly radio

PROOF

Col. James G. Hall, source of this article, heads AAF reconnaissance.

range and therefore must be a crack navigator, and you have an unusual combination of skills."

Colonel Hall ought to know. He recently returned from England where he was commanding officer of a photo reconnaissance and mapping group with the Eighth Air Force. Operating only a little more than seven months, members of the group won many decorations for their work. The colonel himself flew 10 missions and is probably the oldest man—he's 46—to fly combat in a *Lightning*.

Combat in this group is particularly difficult because the planes carry no armament. The pilot must depend on the *Lightning's* super-speed and on his own evasive tactics to get him through. Colonel Hall says that his *Lightning* can outrun anything the Germans have, and that includes the Messerschmitt Me-109G, although sometimes the Nazi flyers jump the flying photogs from superior altitude. Though these unarmed reconnaissance planes are intercepted on every mission they get through with an average that compares favorably with that of the day bombing missions and more than 50 per cent of those shot down later report from prison camps.

Photographing targets to ascertain bomb damage after a raid is only a small part of the work of photographic reconnaissance. Frequent flights over enemy ports enable photogs to maintain accurate check on the movement of all shipping. The exact location of practically every German naval and important commercial vessel is known. An outstanding example was the discovery of the *Scharnhorst* and the *Gneisenau* at Brest. Once important naval vessels are discovered it is a simple problem to check their movements. Pilots simply photograph the few places where they can possibly be docked.

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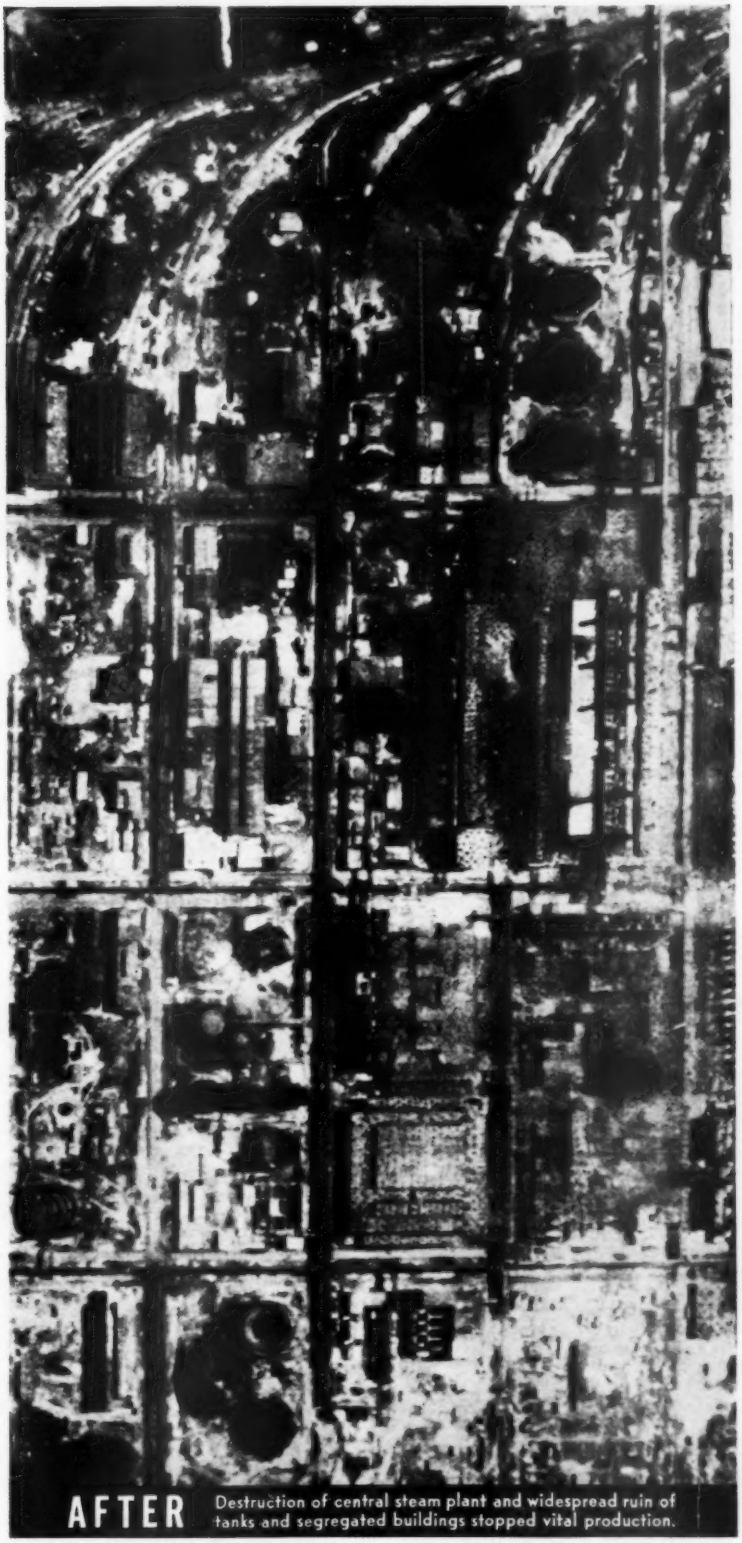

AFTER Destruction of central steam plant and widespread ruin of tanks and segregated buildings stopped vital production.

Test Engineer Marietta Hilton helped develop new gauge. Here she threads tiny wires onto pins of a celstrain weaving jig.

PIGMY GAUGE

By MERLE BRADY

Test Engineer, Consolidated Vultee Aircraft Corporation

Jiny wire gauges costing only 20 cents provide amazingly accurate readings of stresses and loads in airplane tests.

Nimble-fingered girls make and inspect celstrain gauges at Consolidated Vultee.

Small size of gauges can be judged by comparison with nearby screws and rivets.

Convair engineers install more than 100 gauges in cockpit for pressure testing

The author taking celstrain readings. By reading these few dials he ascertains the strains at hundreds of gauges.

IT'S a simple copper-nickel alloy wire so fine it can be laid alongside itself 1,000 times before its combined width touches the ruler at the one-inch mark. Wound around several needle-like posts and formed into a running-S, insulated by thin pieces of paper and connected properly to a pair of leads, it becomes one of the most effective research tools to find application in aeronautical test engineering. With it you can test for load, pressure and stress, quickly and accurately. It tells you far more specifically than can other means of observation what goes on in any component of an airplane during either static or dynamic test.

Consolidated Vultee test engineers call this ingenious device a celstrain gauge. Perhaps it is more generally known as a resistance wire strain gauge. Its weight—1,600 to the pound—certainly is no measure of its usefulness. Its range of application, already wide, is growing rapidly. Test engineers, under direction of the test department's chief, Ken Jackman, employ celstrains to measure loads or forces on special research projects to a fraction of an ounce, measure hydropress rubber pressures simultaneously in three dimensions, check both static and dynamic stress on aircraft at rest on the ground and in flight, measure bolt loads in structural splices, record impact loads at high and low frequencies, indicate wind tunnel model hinge moments and measure control system and cable loads.

Several score gauges may be placed on an experimental wing during a static test. As many as 120 celstrains may be read on two indicating units in five minutes. Heart of the indicator is a light-beam galvanometer employing a sensitive Wheatstone bridge, in which the gauge circuits are progressively placed and read. Simple mathematical conversions reveal the amount of stress under each load. Being relatively insensitive to temperature and immune to vibration effects, and costing only 20 cents each, the tiny gauges enable the engineers to check a structure accurately, faster and at lower cost than by older methods.

Currently, Jackman and his test engineers employ celstrains as a final and conclusive check on engineering analyses. The procedure is something like this: A group of stress analysts make certain calculations. In due course, the test engineers conduct stress tests of the components under consideration. Shortly, the celstrains reveal how closely the engineers approached the actual stresses. Further, on the basis of the celstrain checks, everyone concerned will know to what extent mathematical calculations may be relied upon.

So much reliance does Convair place in the tiny gauges that three-fourths of their applications are made to various structures, from fin and rudder to wings, of such planes as the *Liberator*, the *Catalina*, the massive *Coronado*, and to a new experimental heavy bomber.

On one recent static test, some 400-500 gauges were concentrated in a relatively small area of a wing to yield a fairly complete picture of the stress distribution over the hat sections, stringers and skin. They also are used to determine stress in the framework of the glass structure which encloses the nose and tail sections of an experimental plane which is to be pressurized.

Another typical installation would see the gauges scattered at strategic spots over a pressure cylinder representing a scale section of a pressure cabin. Here they may be in contact with the aluminum alloy skin rather than on glass framework, as above. In such a case, if the gauges are cemented on a thin, unsupported sheet, one gauge will be necessary on each side. These will be read separately in order that calculations may be made of the amount of bending and axial stress present; or they may be electrically connected in series, thus nullifying the bending stresses and indicating only the axial tension or compression stresses.

On heavy sheet, or on stringers, angles and flanges, for example, only one gauge is required, provided secondary bending is not a sizeable factor. Gauges mounted in series on a test specimen also have been used to obtain directly the average strain across the section.

One important application of the gauges is as control on stress in vibration tests, in conjunction with fast-recording equipment. For this purpose, the gauges are cemented to the specimen at critical points, on both sides, thus providing automatically for temperature compensation when connected to opposite sides of the circuit, or bridge. During such tests, the vibration machine is adjusted in intensity to give the desired stress, so that future tests may be compared to this one in stress and/or loading.

Several components of an airplane are subject to both stress and vibration. To what stress will these parts be subjected? Celstrain gives the answer, both on the ground and during flight. For the latter tests, a motor generator supplies required power.

Celstrain gauges are assembled on tiny

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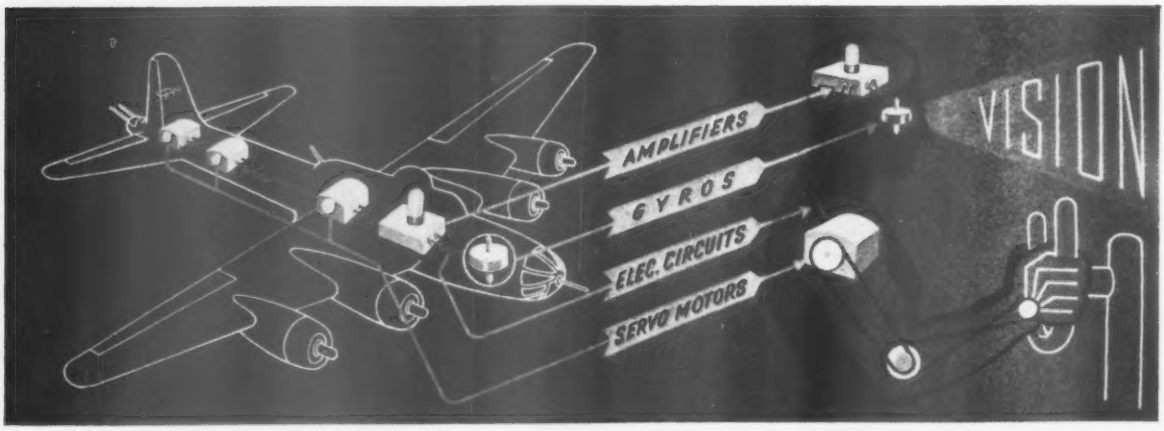


Gyroscopes are autopilot's eyes, amplifier is its brain, electronic circuits are nerves, servo motors are muscles.

ELECTRONIC PILOT

Linked with bombsight and capable of 300 corrections per minute, autopilot holds plane steady on its run.

Pilot flips switch on Fortress autopilot. The small instrument panel is installed between pilot and co-pilot just below the throttles and propeller pitch controls.

HIS calls to the pilots brought no response. The bombardier climbed from his compartment in the *Fortress* and made his way to the cockpit. To his horror he found pilot and co-pilot slumped in their seats, badly wounded and unconscious.

Pulling the pilot from his seat, the bombardier took his place and turned a few dials. The mighty bomber swung into a wide turn, straightened out and headed for England. Three hours later it settled to a crash landing, its crew safe but for the wounded men.

This miracle of flight was accomplished by a new automatic pilot whose story now is being told for the first time. The success of every bomber raid today is due in part to this device which is linked with the Norden bombsight.

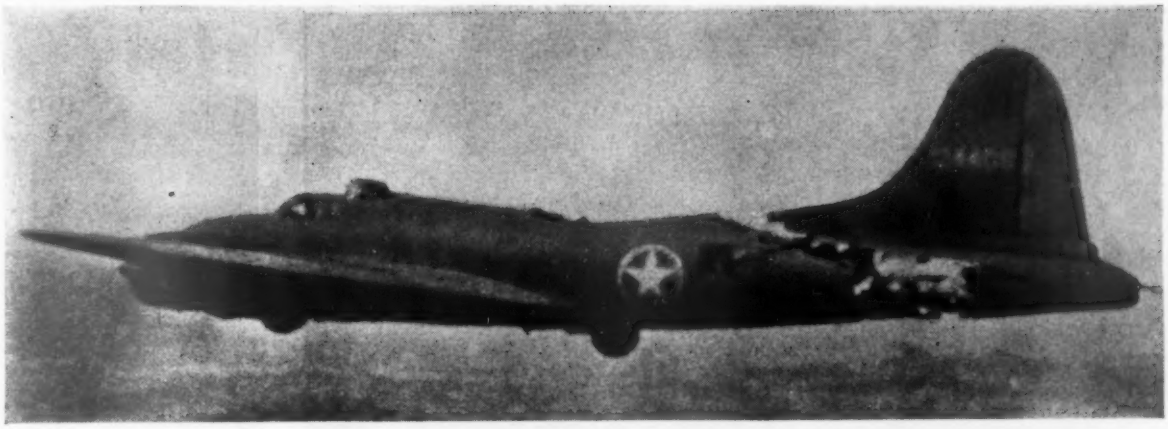
This autopilot makes four important contributions to AAF bombing raids. It holds the plane on an unerring course. It relieves pilots of fatigue by taking over their duties for long periods of time. It has saved many lives because of its ability to fly the plane even after the controls have been shot away. Most important, it gives the bombardier a steady aiming platform.

In a trip like the bombing raid on Bangkok, Thailand, from bases in India, for example, Maj. Harry Watkins led his squadron through to the target in a flight lasting 16 hrs. 30 min. Sixteen hrs., 10 min. of the time he used the autopilot. The 20 minutes of manual control were used in taking off and landing.

Capable of more than 300 flight corrections per minute, the autopilot, manufactured by Minneapolis-Honeywell, holds a plane rigidly on course during the bombing run, when an error of just one mil would cause the bombs to miss the target by more than 360 feet.

Use of the Minneapolis-Honeywell autopilot has reduced precision bombing's mean error by 50 per cent. Thus, if the mean error is reduced from 1,000 to 500 feet, the bombing effect is quadrupled.

This means that nine planes can do the work of 36. Return trips to the target



Nearly slashed in two by diving German fighter, this Fortress limped home solely by means of the autopilot.

are cut to a minimum, fewer lives and planes are risked, hence fewer are lost. Materially, fewer planes and men must be provided; logistically, fewer planes and men need to be maintained. Result is an incalculable saving in men, money, planes, materials, transportation and time.

The M-H autopilot is similar in principle to the automatic pilot used by commercial airlines, though more precise. The gyroscope remains its basic instrument.

The autopilot differs from the familiar Sperry gyropilot, which is used on commercial airlines, in several ways. It is fully electrically operated. Its servo motors connect directly with the surfaces being controlled, whereas the Sperry pilot controls the surfaces by small hydraulic pumps operated by servo motors. The Minneapolis-Honeywell pilot has a follow-up system connected with the amplifier, while the Sperry follow-up is connected with the flight gyro.

Long before the human mind is aware that anything is amiss, the autopilot has countered the effect and corrected the deviation from the set course. This is done by two gyro controls. Contacts on the gyroscopes pick up weak electric signals which are amplified and sent by wires to the "servo motors" operating the ailerons, rudder and elevator. The process is reversed when rough air moves the control surfaces.

One gyro control handles the horizontal or directional motion, the other the pitch and roll movement. Sensitivity of the gyroscopes is so acute that the slightest movement of the aircraft causes almost instantaneous reaction on the controls.

The heading is controlled by the directional gyro, in the nose of the aircraft, which operates both the pilot direction indicator (PDI) and the directional panel. Two wiper arms are on the directional panel, one each for ailerons and rudder, the latter pivoting on the directional panel. Ends of the pickups are attached to the dashpot links, preventing sudden skids from affecting the

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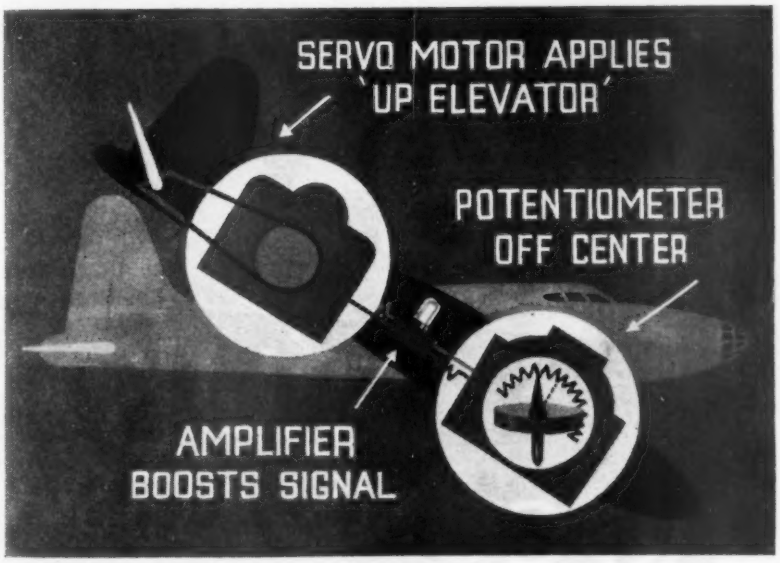
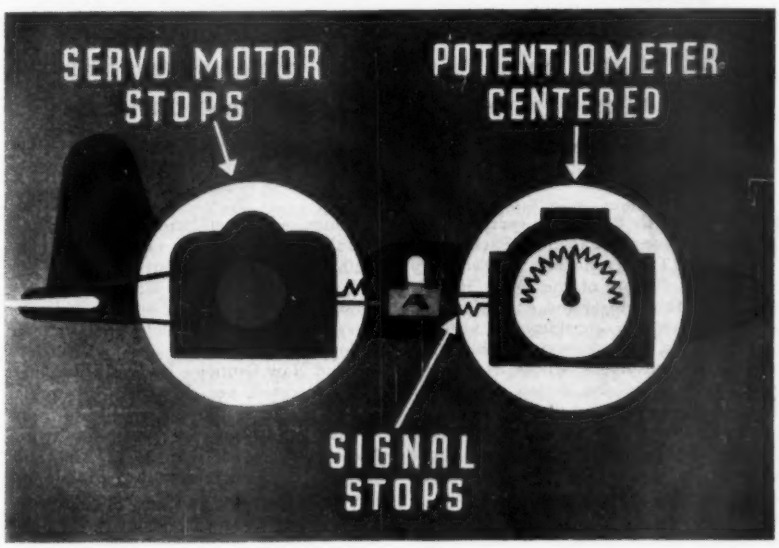
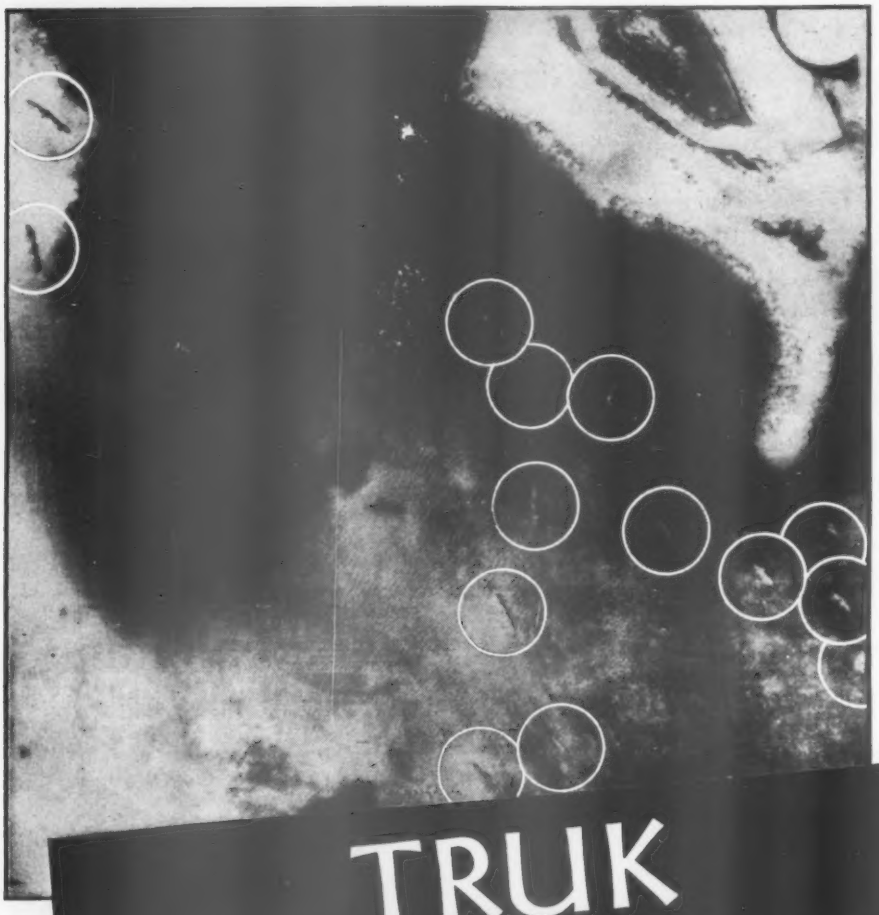


When plane starts flying nose down (above), wiper on potentiometer is moved off center and amplified signal to servo motor moves elevator to bring plane back to level flight.





Flight Lieut. R. Yeowart above, led flight on Truk which took photo shown at left. He is the only man of the flight left alive.

TRUK RECONNAISSANCE

An Australian-manned Hudson photographed Truk more than two years before our Navy airplanes bombed the mighty Japanese sea and air base.

WHEN the U. S. Navy's carrier force planes gave the Japanese Pacific bastion of Truk a lacing in February and wrote off part of the Pearl Harbor debt by sinking 19 of the enemy's ships and destroying a considerable number of his planes, well deserved praise went to the Marine flyers whose reconnaissance had made the action a success. That flight was typical of Marine daring and competency. Some of the American correspondents reporting that epic flight suggested that it was the first ever made over the enemy stronghold. Actually it was the third. The first and second were carried out in January, 1942, by Australian-manned American-built planes.

Only one man of the original flight remains alive—Flight Lieut. R. Yeowart—and he has now been permitted by the Royal Australian Air Force to tell the story. His comrades met death in later actions with the Japanese over New Britain and New Guinea. None of these men was decorated, yet they may be ranked among the outstanding heroes of the war.

When the Japanese push southward became a definite menace to Australia, the RAAF was driven to desperate measures to slow Jap progress as much as possible. Japanese bombers based on Truk had begun to hit at Australian-held Rabaul. The Aussies decided to pay the Japs a visit. Consolidated *Catalinas* were available for the bombing and their crews were eager for it, but first a thorough reconnaissance job was necessary. Two new Mark IV *Hudsons*, just arrived from America, had been assembled.

"These were the babies we had been waiting for," said Yeowart. "Flying Officer R. M. Green and I had been drawn for the reconnaissance work. We didn't have any trouble getting crewmen. The whole squadron volunteered. So we picked our men and spent a couple of days getting used to the *Hudsons*. They were the sweetest looking planes we had seen. The boys named my plane 'Titwillow' and Green's 'Yum-Yum.' Officially, the flight became known as 'The Mikado Special'. Flying Officer R. R. McDonnell was my co-pilot, Sgt. Bill Ellis the radio man and Sgt. Frank Marriner the rear-gunner. They were a happy and efficient

(*Continued on page* 166)

THE AIR MUST BE FREE

Maintenance of unrestricted airways in the post-war world is urged as a war barrier by an authority on international law.

By

ELBERT D. THOMAS

U. S. Senator from Utah

Former professor of political science at the University of Utah, the author is a recognized authority on international affairs. He has served as vice president of the American Society of International Law, vice president of the American Political Science Association. Born in Salt Lake City in 1883, he has represented his native state in the U.S. Senate since 1932.

THE airplane can, given the opportunity, contribute as much to lasting peace as it is contributing today to winning the war. But I am writing with the conviction that this peacetime contribution will not be possible if we hamper aviation with a pre-post-war balloon barrage of oratory, excessive regulations and dog-in-the-manger nationalistic taboos.

In this war, the airplane has been freed from red tape, from out-worn military ideas, from snail-like production schedules. Magnificent work, by hundreds of thousands of Americans—civilian and military—is behind this achievement. Now it appears imperative that we begin to establish a parallel post-war freedom for aviation, else it is endangered of returning to its former role of a troublesome stepchild. If it does, it will be denied one of the golden opportunities of this or any age to build an aerial highway toward permanent peace.

More can be contributed to better international understanding by proper regulation and experimentation with the air than in any other single medium.

I have said that it is imperative we do something about this, and you need only read your newspaper to understand the urgency. We are on the eve of a great international conference on post-war aviation. It has been a-building since last July, when Secretary of State Cordell Hull notified Sen. Bennett C. Clark of Missouri, chairman of the aviation subcommittee of the Senate Commerce Committee, that such a conference was contemplated but would not be called until the committee could voice its opinions.

Assistant Secretary of State Adolf A. Berle was put in charge of the liaison work with the Congress. This work went forward slowly until recently, when Lord Beaverbrook, Britain's spokesman for post-war aviation, announced that England was ready for a conference and awaited word from the United States.

Further stimulus to hold the meeting has come from U. S. airlines, who have already done a magnificent wartime transportation job throughout the world—and who are divided sharply on the post-war international issue of whether we should face the world with one airline (a so-called "chosen instrument") or should permit more than one, or many, U. S. lines to enter the post-war world arena as competitive private enterprises.

The impending international conference and the airline debates have raised another—and most important—question. Shall the air be free? Shall our nationals be permitted to fly at will over foreign territory, with or even without reciprocal privileges going to foreign planes flying over the United States?

It seems to me that the answer should be worked out before any other questions are raised. Unless this vital question is answered satisfactorily, we may find ourselves building, not for peace, but for another war.

I am not alone in underlining the importance of this aspect of the world transport aviation problem. The British already have indicated how vital they consider it. They have gone on record favoring freedom of the air—with reservations. It is the chief of four main topics they propose be discussed at the coming conferences.

"His Majesty's government," said a recent official statement, "would welcome a greater measure of Freedom of the Air than existed before the war, but . . . the extent to which freedom of the air can be realized must depend on general acceptance of an enlightened international settlement."

Jointly-operated United Nations lines "in particular areas . . . now operated by enemy airlines and routes passing through areas of vital security interest" are also recommended.

It is precisely this type of generalized recommendation that must be avoided if we are to nail down air freedom as the main plank in a platform on which may stand a permanent peace. I do not believe the British answer is specific enough, nor sufficiently inclusive; nor does it outline a pattern for permanent peace.

To put it more constructively, I believe that, first of all, there should be established in the world certain free-air cities, or free-air islands.

This should not be difficult to do. War victors can reach a decision themselves about enough free air to give all the nations free access to the air. Wide distribution of "free" cities will make it possible to allow nationalistic jurisdiction and control over air to be established in those places where the nations want to maintain that control. It also is reasonable to assume that every nation, no matter how strictly it adheres to national jurisdiction of the air over its own land, will want to have a free city or two, according to the size of the nation, for entrance of planes of all powers. Indeed, I believe that the more the free city idea is developed, the more free cities will appear in the world community.

By "free" cities I mean cities which permit entrance and exit of planes of all nations without any reference to reduction of restrictions in regard to trade or immigration. I am purposely avoiding the question of freedom of trade or free entrance of persons. Air over the oceans and the high seas, of course, should remain free. This freedom should be maintained by international agreement and by policing, if necessary, by United Nations planes.

It follows that those nations which control the air over the poles should grant free air in those areas to all other nations of the world. Nor can I emphasize too strongly my feeling that the air over each one of the Axis powers—Germany, Italy, Japan, and all their satellites—should be made free.

This would have two advantages. In the first place, much of the need for a United Nations peace force or an international police force to curb aggression will be accomplished, because free air over the former enemies will eliminate the necessity for constant patrols. Second, after a time we would know the advantages or disadvantages afforded to nations whose air is free—and I believe that free air will prove a distinct advantage over a period of years.

Other free areas should be specified at the conference table. The air over such rivers as the Rhine and Danube—already internationalized—should be free. Similarly, the air over all of the mandated

(Continued on page 153)

LATIN AMERICA MOVES BY AIR

Douglas DC-3 belonging to Aerovias of Guatemala lands supplies at a jungle airport and picks up load of chicle.

☆

By RAYMOND NATHAN
Information Division, Civil Aeronautics Administration

Rugged terrain and primitive land transportation has led Latin America to skip the road-building stage in many sections. More than six times as much freight moves by air as over U. S. airlines.

☆

"THIS is the Quito airport calling, Senor. You had better get your truck down here pronto—a big shipment of felt hats, eyeglasses, stockings and drugs has just landed from Buenos Aires."

Such a conversation is not at all uncommon in Latin America, which shipped by air in 1942 six and one-half times as much freight as moved on U. S. airlines. Rugged terrain and the relatively primitive development of other means of transportation make aviation a natural for Central and South America.

The Latin American countries have more route miles than the United States and even more rapid development of aviation below the Rio Grande is in prospect as war restrictions lift.

It is not hard to understand why the people of the other Americas are so ready to make the jump from ox cart to air-

Latin America's air network. Note that many of the lines follow the seacoasts or rivers where means of transportation already exist, because the large cities are established on these arteries. A few strike out boldly across country, however.

plane. Just five years ago, for example, hardships of the overland trail between Lima and Iquitos, Peru, were such that many preferred to make the trip by ocean steamer, sailing north, passing through the Panama Canal, turning south to the mouth of the Amazon, then 2,300 miles up the Amazon, a trip totalling 8,000 miles and taking at least 30 days. Today it is a 745-mile airline trip, made in a few hours.

Railroads are a rarity (airline mileage exceeds railroad mileage in nine of the 12 South American republics), highways worthy of the name are almost as scarce, and the prevalence of high mountains and thick jungles makes the cost of installing roads or railroads prohibitive. Engineers estimate that it would take five years and $7,000,000 to build a highway from Cochabamba to Santa Cruz, Bolivia, a distance of 276 miles. To put in two or three airfields requires perhaps one-fifth the time and one-tenth the money. Planes are now actually making this trip, with local stops, in three hours.

The Aramayo mines in eastern Bolivia could not operate without airplanes, for the cost of building an adequate road, according to the manager, would be more than the mines are worth. By air, however, they are 30 minutes from the municipality of La Paz, against 15 *days* by trail.

Topography thus gives air commerce a natural advantage. While in the United States the airplane must compete against railroads that can move freight at one to four cents a ton-mile, in some of the mountain republics the cost of inland ground transportation often doubles the price of merchandise shipped from abroad. Even before the war increased insurance and other rates, surface transportation costs on a ton of hardware sent from New York to Bogota, Colombia, exceeded the value of the merchandise.

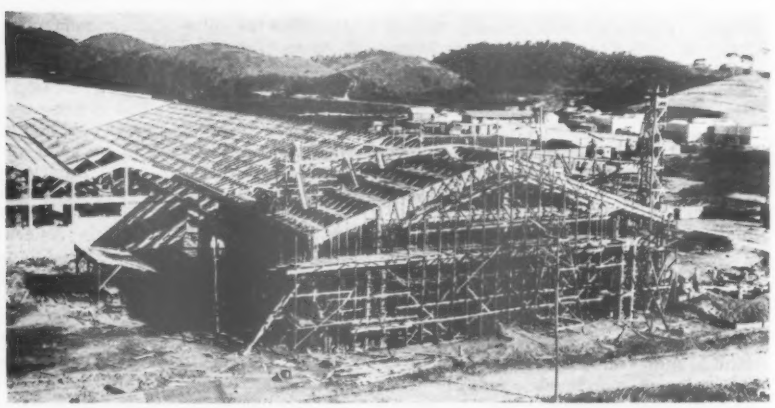
As an example of what the airplane has to offer South Americans for passenger travel, there is the trip from Loja to Cuenca in Ecuador. The ticket for the 45-minute plane ride costs less than the mule hire for the five-day overland route.

Passenger traffic in Latin America, on the other hand, has not dominated the air transport picture to the extent that it has in the United States. Latin American passenger traffic in 1940 amounted to only 17 per cent of that in the U. S., although the Latin American companies had almost as many multi-engined planes and made more than twice as many scheduled stops. Freight tonnage, however, was six and one-half times that of the United States in 1942.

The Central American airline, TACA,

Ford trimotor in Andean foothills takes cargo of cinchona to Colombian seaport.

Attractive waiting room of the vigorous TACA airline in Tegucigalpa, Honduras.



Buildings of National Motor Factory under construction outside Rio de Janeiro.

for example, derived 51 per cent of its 1940 income from freight, against 44 per cent from passengers and five per cent from mail. While TACA was the leading freight carrier, cargo can generally be expected to account for a much larger share of revenue than it does in the United States until the standard of living of the mass of people is raised sufficiently to permit extensive travel by any mode. Meanwhile, opportunities for expansion of both air cargo operations and of passenger movement are bright—25 U. S. companies have attested their belief in this by applying for new routes to and through Latin America.

A fantastic variety of merchandise is already carried on the airlines to the south. One shipment on the line operated in Peru by ex-U. S. barnstormer Elmer Faucett consisted of nine pedigreed bull calves, with their owner and four members of his family. Thousands of pounds of orchids have been shipped weekly from Medellin, Colombia, to the United States, while baby chicks are rushed by air from this country southward. The chicle for our gum, which once took six days on muleback to get out of the Honduras forests, now comes by air in 30 minutes. Fine Peruvian tobacco, Mexican coffee and ore concentrates, live donkeys, barbed wire, bags of cement, and mining machinery are just a few of the items to be found on the cargo lists. One TACA plane is even fitted with a 600-gallon tank for handling fuel oil shipments.

Twenty-eight tons of onion seeds were flown from Argentina to the United States to supplement the below-normal 1942 onion seed crop in this country.

When the Huanacopampa gold mines were being developed some 13,000 feet above sea level in Peru, it proved impossible to ship heavy pieces of machinery over the 10-day trail because at that altitude a mule cannot carry more than 200 pounds. A trimotored plane did the job, however, bringing in more than 700 tons of machinery.

Rubber, mica, quartz, industrial diamonds, and quinine bark have become very important inter-American air cargo during the war period. In the first half of 1943, airplanes brought 500,000 pounds of Latin American rubber to the United States, and with thousands of gatherers being moved to the Amazon Valley producing areas the volume of air shipments appears likely to spurt. Lloyd Aereo Boliviano has recently opened air service from La Paz, Andes Mountain capital of Bolivia, to Riberalta, one of that country's rubber-producing centers in the Amazon lowlands. Food, drugs and equipment are flown in and the rubber carried out.

La Paz has successfully brought fresh beef by airplane from San Borja, a flight of only 35 minutes requiring no refrigeration. If planes were available, ranchers of Salta, Argentina, would emulate this example. They now drive cattle across the desert and the 12,000-foot Socompa Pass of the Andes to Antofagasta, Chile, but the cattle are more bones than meat by the time they arrive.

(*Continued on page* 120)

FLIGHT NURSE

Flying nurses on parade. Douglas Skytrain in background is quickly convertible from hauling cargo to evacuating wounded soldiers or carrying passengers.

By Lieut.
GEORGE MASON
Army Air Forces

Many a wounded soldier owes his life to the flight nurse's care on his trip to the hospital.

SOMEWHERE at an isolated air base in New Guinea steam is rising from the jungle. The boiling sun is baking everything in sight. Sweaty mechanics are starting the engines on a heavily camouflaged transport plane.

Under the wing—in the only habitable shade for miles—a young American girl is mopping the brow of a wounded American soldier with cool water.

She is wearing gray Army coveralls, much fresher than the blood-stained and mud-caked fatigue clothes of the man lying on the stretcher. Suddenly the air comes alive with the deep-throated roar of two 1,200 h.p. engines.

Two stretcher bearers help the girl place the wounded soldier in the plane's big cabin. Nine others are already secured in place. Just before the door is slammed shut a flight surgeon jumps aboard for a last-minute check of the wounded.

He looks at the boy just loaded. Softly, he speaks:

"Nurse, on the way you'd better give this man some plasma."

Minutes later the big transport has climbed into the tropic sky and leveled off at 7,000 feet. A medical orderly cares for the needs of the nine other men while the flight nurse prepares to aid No. 10.

Deftly she prepares the plasma for transfusion. The soldier, an infantry sergeant from White Pigeon, Mich., opens his tired eyes long enough to watch her work to save his life. When the transport settles down to a smooth landing at a big air base well behind the lines, ambulances are waiting.

Even as you read these words this story is being repeated in some corner of the globe, for Air Evacuation Units of the Army Air Forces are saving precious lives in round-the-clock performances of devotion to the sick and wounded.

Nowhere in the inspiring history of nursing has a nobler chapter been written. What little has been told so far is a staggering preview of achievement. The flight nurse is the red-head of whom your wife got jealous when you were laid up with influenza in the hospital at Spokane. She is the girl who was sipping cokes in the corner drug store at Bangor, Me., with her boy friend just before going on night duty. She swam with you in Little Traverse Bay after you had been released from the hospital at Petoskey, Mich.

Yes, she is the charming air hostess who served you a turkey dinner that Thanksgiving Day when you flew from El Paso to Fort Worth. And she's the girl who did private duty when your mother was so ill at home. You remember her. That's the same girl who is now blazing a glorious record in the skies.

The idea of removing the sick and wounded from combat zones by plane is a development of this war.

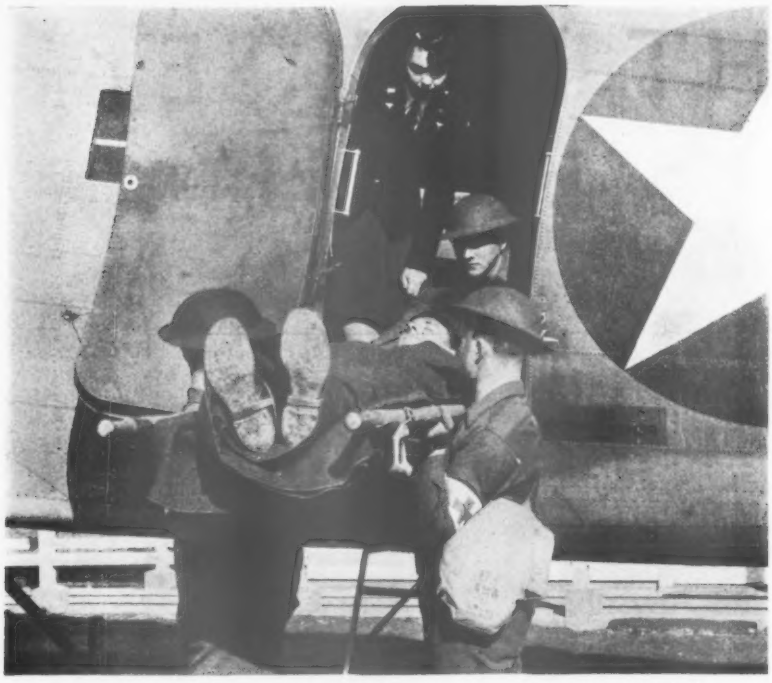
Creator of the Air Evacuation Service is the Air Surgeon of the Army Air Forces, Brig. Gen. David N. W. Grant.

As troop carrier planes race toward battle areas with paratroops and supplies they are combat ships and cannot, therefore, display the Red Cross emblem of immunity on their return flights with the wounded. Enemy fighters often regard these ships as excellent targets.

The number of wounded that can be evacuated on each flight depends on the size of the airplanes, ranging from 18 to 24 and this figure will be increased as larger aircraft, including the four-engined Douglas *Skymaster*, are made available to the Troop Carrier Command.

Pilots are specially trained to fly at levels where smooth air prevails to give the evacuated as comfortable a flight as possible. The less seriously wounded are placed towards the rear of the cabin where the yaw of the plane is the greatest. The more serious cases rest far forward.

Usually the pilot and the flight nurse



Easy does it. Under supervision of flight nurse, a "wounded" soldier is loaded aboard air evacuation plane in practice simulating combat at Bowman Field.

work as a team, conferring on altitude to be flown. If there is a lung injury aboard, for example, the pilot will fly at less than 10,000 feet. At the outset of Air Evacuation, many medical men thought it would be dangerous to remove certain cases—such as brain and abdominal—by air. But all types of patients have now been flown without complication. In fact, as this is written only two patients have died enroute—a remarkable record, considering the thousands of dangerous cases that have been handled.

From a morale standpoint the Army has found the presence of flight nurses to be as uplifting to the wounded as air hostesses are to the commercial air traveler.

Air evacuation nurses at Bowman Field base of First Troop Carrier Command participate in simulated gas attack. Nurses must know how to use gas masks.

When evacuation by air appeared to be the means of saving untold numbers of lives, the Troop Carrier Command undertook to train its own personnel. A training center was set up at Bowman Field, near Louisville, Ky., and a call was sounded for registered nurses.

In a day's time scores of airline hostesses were being sworn in as second lieutenants in the Army Nurse Corps and started for Bowman Field. They were skilled in the dual role of flying and nursing. The combination made for the title "flight nurse." Streams of registered nurses volunteered and in eight weeks time were off to North Africa and the Southwest Pacific.

For six weeks the nurses are given a broad refresher course in nursing and are specially schooled in military customs and problems peculiar to air evacuation. Col. E. R. Bergquist, chief surgeon for the Troop Carrier Command, prescribed the curriculum and supervised the first classes.

Within a month's time so many regular Army and civilian nurses had volunteered for flight nursing work that the recruiting had to be diverted into the heavily-drained pool of nurses for the armed forces.

With little fanfare and a minimum of military ceremony, the first class of flight nurses was graduated at Bowman Field on February 19, 1943. Brig. Gen. Fred S. Borum, former commanding general of the First Troop Carrier Command, pinned the coveted gold wings on the tunic of the bright-eyed graduates.

Days later, at bomb-pocked Henderson Field, Guadalcanal, a troop carrier plane completed a transpacific flight and pulled up to a stop. Officers and soldiers tripped over each other to reach the plane when word went around that a white woman had arrived. They hadn't laid eyes on such a phenomenon since Uncle Sam's flag first flew over the field.

Sure enough, standing in the doorway and looking fresh as a daisy was Lieut. Mae Olsen, flight nurse. Two months before, Mae Olson—who hails from Little Falls, Minn.—had strolled into the American Airlines operations office at Chicago after her regular run from New York to announce that she had completed her last trip for a while.

Dozens of Mae Olsen's classmates fanned out all over the globe to take up similar assignments in combat zones. Newsreels have dramatized the many lives that have been saved by Mae Olsen's ministering of blood plasma in the Southwest Pacific. And still to come are tales of the heroic exploits of her sister nurses.

Other large airlines have lost veteran air hostesses, many of whom had rolled up a million miles of flying experience before joining the armed forces.

Take Ellen Church, for example. She was mentioned in an obscure wire service story from General Eisenhower's headquarters. It read something like this: "Another woman who had done heroic work yesterday in the drive towards Bizerte was Lieut. Ellen Church, a nurse in the Air Evacuation Unit of the Army Air Forces."

(*Continued on page* 166)

One of 18 craft in the AAF's naval unit at Foster Field, Tex., patrols water stretch flown in gunnery training.

G. I. NAVY

By MAURICE RODDY

Aviation Editor, the Chicago "Times."

Rescue of pilots, salvage of planes and transport of materiel keeps "navy" busy.

AROUND Port O'Connor, Tex., Uncle Sam's "G.I. Navy" is the talk of the town. Under jurisdiction of Foster Field, one of AAF Training Command's advanced fighter pilot schools, this unusual unit was created to move Army men and equipment across water. The choice, in 1941, of Matagorda Island and Matagorda Peninsula—a few miles off the Texas coast—as sites for aerial gunnery ranges and landing fields was responsible for the founding of the 1004th Boat Company, Quartermaster Corps, to be stationed at Port O'Connor.

The Army's navy first took to sea in November, 1941. It has since grown from a lone chartered shrimp boat to an 18-craft, Army-manned flotilla including 83-foot rescue boats.

Growth of the "G.I. Navy" paralleled development of the two AAF Training Command bases on the barren island and peninsula. The Army's first boat plied between the mainland, island and peninsula carrying military personnel for inspection of the proposed sites. The shrimp boat was the main transportation artery for the first detachment of 18 men stationed on Matagorda Island.

The "G.I. Navy" developed rapidly. In January, 1942, the Quartermaster Corps at Foster Field, called for volunteers to man a detachment to be stationed at the port. Eight men—including Sgt. Burney Carter and Warrant Officer Terry M. Carroll—volunteered. With them came four 22-foot, 95 h.p. boats. The eight men converted a fishing shack into a barracks and started assembling a fleet.

To properly fit them into their jobs with the new boat outfit, all of the original "soldier-gobs" had either nautical or suitable mechanical experience. Sergeant Carter was a Diesel engine expert in civilian life while Carroll actually joined the Army to continue his civilian career of boating which he pursued on the Mis-

(*Continued on page* 162)

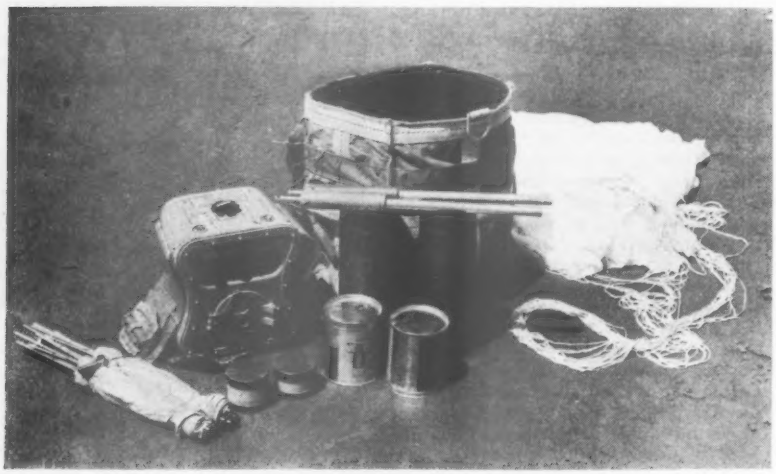
Sailor-garbed Staff Sgt. Neal Pawley "shoots" the sun from the crow's nest of one of the AAF's flotilla. Note the AAF's insigne flying from the masthead

"GIBSON GIRL"

This compact radio transmitter has brought help to distressed Allied airmen all over the world.

Hand crank generates power sending SOS over 100,000 square miles.

Waterproof bag protects radio set and accessories on overwater flights.



"CALLING Destroyer Command. *Flying Fortress* crew down at sea . . . taking to life rafts . . . need help . . . position . . ."

"Walkie-talkie report from Colonel Jones. Nearing position of flyers forced down in jungle. Signal from their 'Gibson Girl' coming in strong."

"Base to rescue party. Men from *Liberator* crew report desert heat affecting them badly. Can you speed up contact?"

Such radioed reports reach the Air Transport Command from all over the globe. Within the outwardly prosaic files in the ATC offices, just outside of Washington, D. C., lie some of the most thrilling stories the world has known. A little later in this article we will take a peek into those files.

Woven inextricably into the stories is another tale—that of a small, manually-operated life-saving radio—the "Gibson Girl."

This nickname was given the set during its secret development by engineers of Bendix Aviation, Ltd., North Hollywood, Calif., and was later picked up by American flyers. Officially the SCR-578, the "Gibson Girl's" nickname came from its wasp-waisted construction, curved in the center so that it may be held firmly between the knees on a liferaft.

The device is a handpowered, foolproof emergency radio transmitter, designed primarily to speed the rescue of airmen forced down at sea. Already thousands of planes are equipped with these sets and more are being turned out daily at the Bendix plant.

It weighs 33 pounds, including all accessories, and is unsinkable and waterproof. By simply turning a small crank on its top the transmitter generates an automatic SOS with an effective area of 100,000 square miles. It is pre-tuned to the international distress frequency of 500 kilocycles.

All ships at sea and all Coast Guard stations keep a 24-hour watch on this frequency. Under peacetime conditions the distress signal will trip autoalarms, establishing a signal circuit and setting off gongs, sirens, or other attention-compelling devices.

The only preparation for sending out a signal on the "Gibson Girl" is the raising of an aerial. This is done by means of a kite or, if the weather is calm, by a balloon. Hydrogen for the balloon can be produced by immersing a simple generator in the sea.

The balloon or kite is flown with light

(*Continued on page* 144)

Army dispatchers assist military pilots in filling out Form 23 and meeting other requirements for flight clearance.

FLIGHT CLEARANCE, ARMY STYLE

By M/Sgt. BENJAMIN A. GILILLAND

Chief Dispatcher, Pope Field, N. C.

Flights from Army bases not only need approval of Airway Traffic Control but must satisfy a detailed series of Army requirements.

TAKE one pilot desirous of making a cross-country flight; add a dash of air traffic control procedure, a pinch of weather, throw in gobs of rules and blank forms—and spice with bits of defense regulations. Mix well—and what you have will be a routine cross-country flight clearance from most any Army Air Forces base inside our continental limits.

You could probably win a bet that the next military pilot you meet is pretty vague about all the ingredients that have to be whipped together before he can get off on his own cross-country flight.

That is the job of the Base Operations Office, pulsing heart of the Army flying field. Normally charged with maintaining flight information on aircraft into and out of their stations, these offices now are knee-deep in extra wartime regulations and procedures.

Unless a pilot has had special duties bringing him close to the machinery of a base operations office he probably considers the necessary delay in obtaining clearance just "another one of those things" designed by the fates to keep him on the ground.

Although every plane which takes the air must have the approval of Airway Traffic Control, if an air base is situated within 100 or so miles of either east or west coasts, routine ATC clearances must be augmented by approval from one or more defense authorities.

If the air base, as most of them do, comes under the direct jurisdiction of bomber, transport, troop carrier or other of the commands, additional regulations governing clearance must be met.

A pilot, flying contact with CAVU

(*Continued on page* 88)

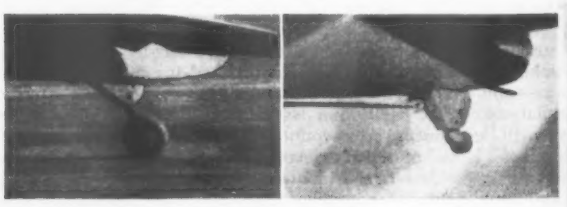
The DAUNTLESS

Carrier-based Dauntlesses on a mission. They are carrying anti-sub depth charges.

The Dauntless is a two-place low-wing monoplane, resembling somewhat the old Army Air Forces Northrop A-17A attack plane of 1936.

All bombs are carried externally on Dauntless. Largest is fitted under center section in displacing gear, others are on wing racks.

ONE of the oldest combat types still in first-line use in the Navy—and still one of the best—is the *Dauntless.* Technically the Douglas SBD, the *Dauntless* has been the mainstay carrier-based dive bomber since the beginning of the war. While still in production, it is gradually being supplemented with the newer Curtiss *Helldiver.* But even today, and particularly against the Japs, the *Dauntless* is a formidable warplane. Powered with a 1,200 h.p. Wright R-1820 engine, its top speed is about 230 m.p.h., stalling speed 78 m.p.h. Service ceiling is over 20,000 feet, tactical radius, 200 miles. Armament is two forward-firing .50-caliber guns and two flexible .30-caliber guns. Wing span is 41 ft. 6⅜ in., length, 33 ft. 1¼ in.; height, 15 ft. 7 in. Bomb load is 1,200 pounds. The cutaway drawing on the opposite page is the Naval *Dauntless;* a version for the Army Air Forces is the A-24, basically identical except for carrier tail wheel and arrester equipment.

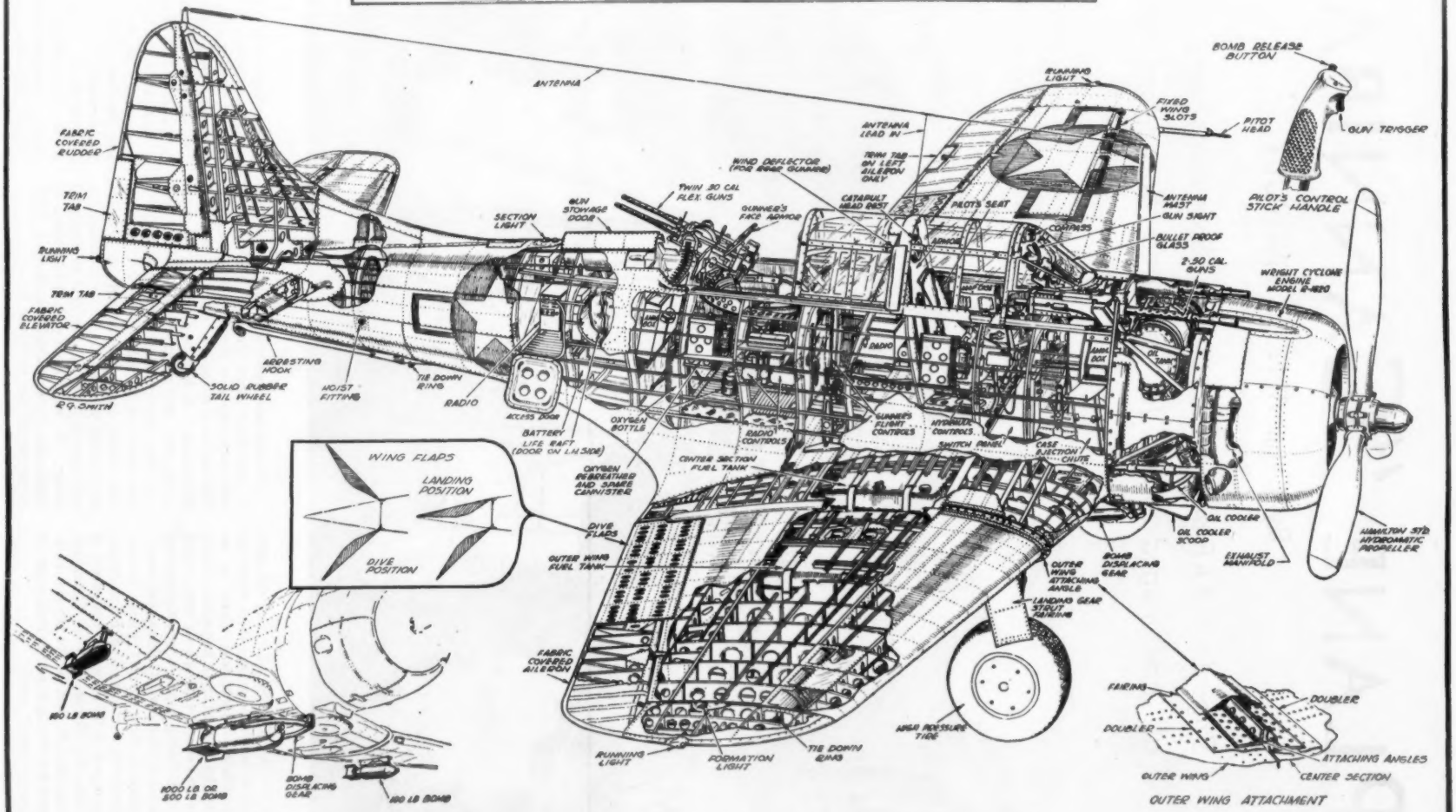


Tail wheels distinguish between Army and Navy Dauntlesses. Pneumatic tire (left) is Army. Small hard rubber wheel (right) is Navy.

DOUGLAS DAUNTLESS

One 1,200 h.p. Wright R-1820 radial engine

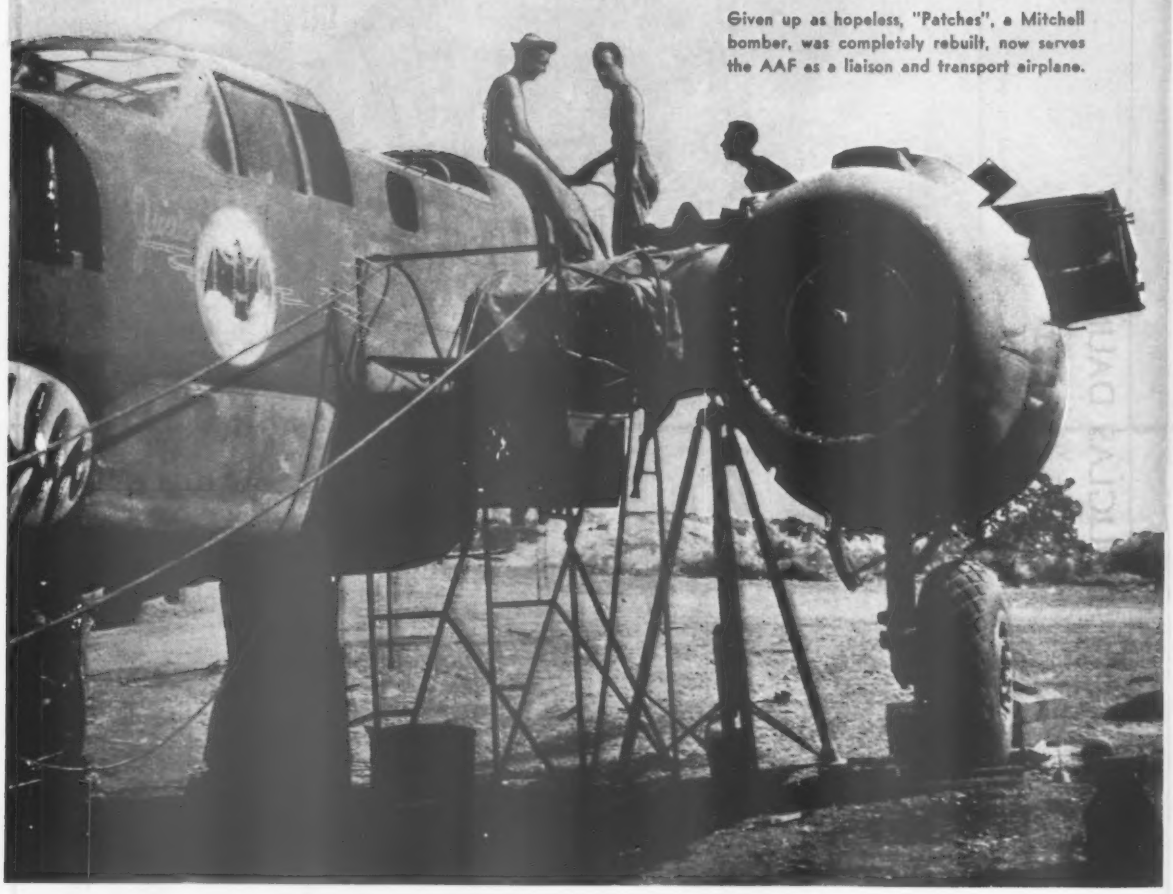
Span: 41 ft. 6⅜ in.
Tactical radius: 200 miles.
Top speed: 230 m.p.h.
Armament: two .50, two .30-cal. guns.



PLANE "CANNIBALS"

By Capt. ALFRED FRIENDLY
Army Air Forces Air Service Command

Ingenious AAF mechanics ransack "boneyards" and salvage all undamaged parts for repairing battle-torn aircraft.



Given up as hopeless, "Patches", a Mitchell bomber, was completely rebuilt, now serves the AAF as a liaison and transport airplane.

MEET "PATCHES," a *Mitchell* medium bomber—or perhaps about 10 *Mitchells*—which was given up as hopeless by the aircraft inspectors but—thanks to "cannibalizing"—is now doing a war job flying supplies, provisions and personnel in the New Guinea war area.

Patches is just one of many accomplishments of a group of soldier-mechanics organized into a repair squadron of the Fifth Air Force Service Command, the organization that backs up the combat units by taking care of their supplies and heavy repair work.

Patches was banged up in a crash back in the days when the Japs still ran the air about any way they liked in that area. The tail was mangled, the fuselage crumpled as if it had been caught in an enormous vice, one nacelle was smashed and the top, from the pilot's seat back to the bomb bay, was chewed to pieces. The crash inspector turned his thumbs down; the wreck was fit for nothing except the salvage of the few undamaged parts. It was doubtful, he added, if even the North American factory back home would try to repair it.

Squadron mechanics, nearly all trained since induction, thought otherwise. It was worth a try, anyway. *Mitchells* weren't exactly plentiful in those days. Percentage-wise, one plane still made a whale of a difference.

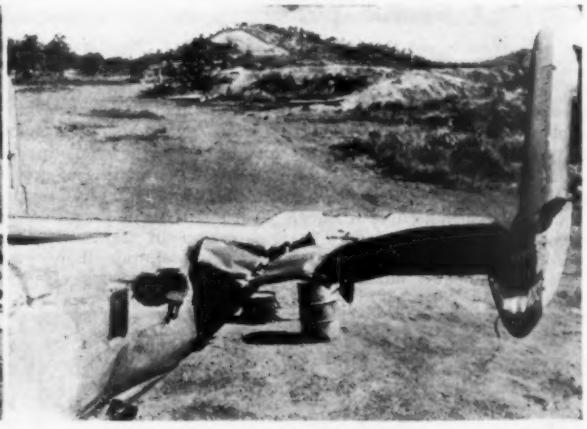
The job took three months, with the composition of the crews varying according to their availability at the moment. Boss mechanic was line-chief T/Sgt. Lawrence C. Alexander, of Hingham, Mass., who used to work in a gas station. With a bunch of former grocery clerks, school teachers, farmers and traveling

"Patches" Before the Operation

Except for wing tips, here is how "Patches" looked before undergoing repair. An entire tail section, from the bomb bay back, was salvaged to replace damaged tail.

After surveying broken back and other damage, inspector wanted to junk plane.

From the pilot's seat back to the bomb bay, the top of the Mitchell was chewed to pieces and required extensive repair.



Close-up of damaged tail. The complete repair job took three months with composition of crews often varying.

salesmen, he went to work on as complex an instrument of death as mortal man has devised.

First of all, the "boneyard", last resting place of fragments of other crashed airplanes, was carefully canvassed. First prize was an entire tail section, from the bomb bay back. It was badly shot up by flak and machine gun bullets but it could be patched. The equivalent section of the wrecked plane was sawed off and thrown away, while the boneyard substitute was fitted on in its place. The damaged nacelle was repaired by the sheet-metal shop in the squadron. So were the flak holes in the fuselage and tail.

From pieces of still other wrecks in the scrap pile, and new parts made by the sheet-metal shop, a new top was made. Odds and ends of damage to the wing tips, the ailerons and the elevators were repaired. Replacement parts were taken from no less than 10 different junked planes. With one thing and another, such as Jap raids, it took quite a time. But today Patches is back in the air. It can't be used for combat purposes —but the Southwest Pacific theater has a new and very fast transport which the records back in the United States never show was sent out.

T/Sgt. William C. Garret, of Denton, Md., and S/Sgt. Paul J. Grimooris, of Altoona, Pa., who worked on Patches, recall another job going on at the same time. Two *Marauders* came back from combat, settled down on fields seven miles apart, and looked as if they, too, would never see action again. Both were badly shot up. Again the scrap heap was searched. A new wing was found for one, spare parts for the other. One had its brake lines shot away. Another needed a new engine and an entire nose section.

The repairman did the job in hitches, working first on one, then the other, depending on what parts were available. They had to bum rides back and forth between the planes and to and from the "boneyard" where they were searching for parts. Both *Marauders* were sent back to combat in first-rate, battleworthy condition.

The same story can be repeated with a dozen variations. The squadron has sent back into combat at least two *Lightnings* which the depot had believed were fit only for salvage. "Sad Sack", a *Mitchell* which came to grief in a crash landing and lost a wheel, a nacelle and a wing, is now dropping eggs on Tojo. Then there was "Sunrise Serenade", another *Mitchell*, which was put into tip-top shape three times and was shot up three times by Jap raiders just before she was to be flown back to the combat outfit where she belonged. She's back at it now, however.

It was that sort of business—getting a plane half fixed and having the Japs bomb it to pieces again—that was hardest to take, according to the squadron's engineering officer, Capt. William. A Stuart, of Sacramento, Calif., who picked up engineering again after a 10-year lapse during which he was ski-instructor, insurance investigator and sales representative.

"That kind of trouble keeps things interesting," he says. Stuart knows whereof he speaks. He and his outfit have been under 58 Jap raids by last count.

One nacelle and the plane's top was smashed. Here it is stripped for rebuilding.

On more than one occasion he was bombed while on the runway, where the nearest slit trench was 50 yards away. If you run, as Stuart made the mistake of doing one time, they lift you off your feet and throw you somewhere. The squadron is sprinkled with Purple Hearts begotten on such occasions.

In addition to the mechanics on the "line," the heavy burden of work in the reconditioning jobs fell to the sheet-metal workers in the squadron. The patching, the construction of entire new wings, wing tips and control surfaces, the making of new longerons and stringers and bulkheads, was accomplished with factory-like perfection out in the field and with no more permanent installation than a canvas supported by a frame-work of poles.

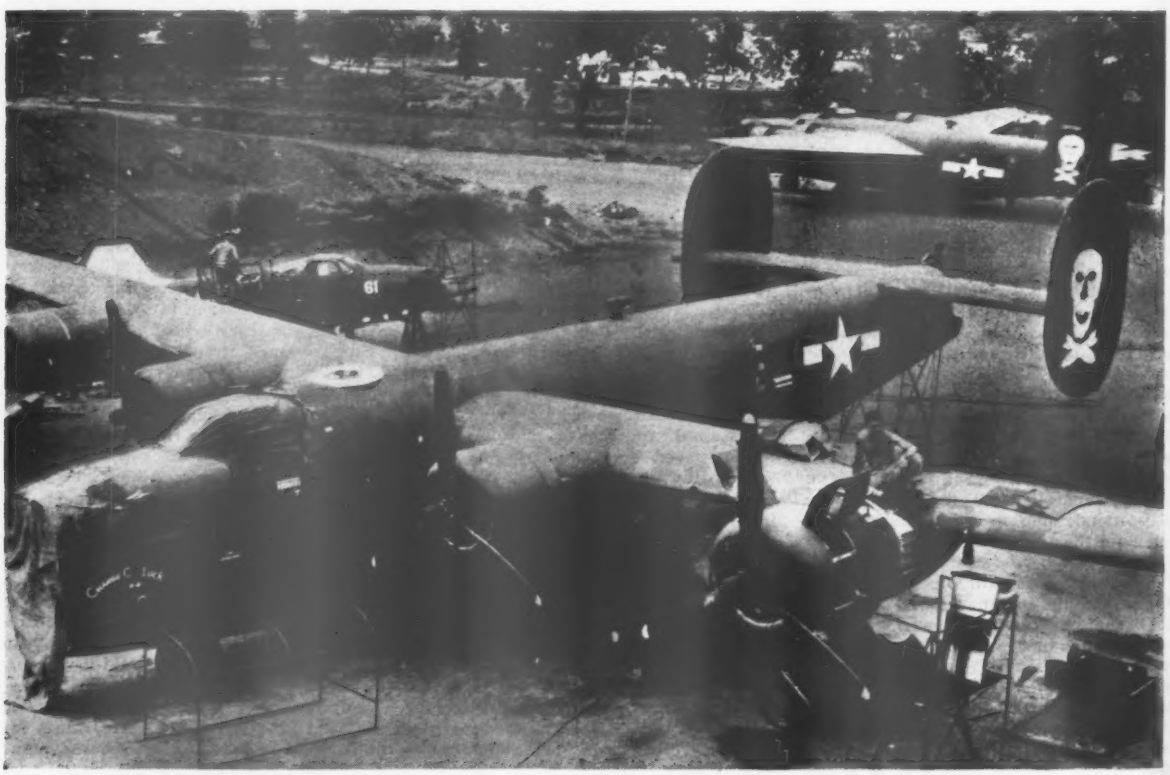
"It really means something," Captain Stuart says feelingly, "when you can pick up a ship, patch it up and watch it fly off."

In the "early days", Stuart recalls, before the Fifth Air Force won mastery of the air over New Guinea, when the Japs raided at will and when American planes were counted in tens instead of hundreds, incredible procedures were resorted to to keep what few planes there were in the air. Parts were at a premium. Critical ones were obtainable only by cannibalizing from a crashed plane of the same type.

"When a plane crashed on the field," Stuart says, "let me tell you, we'd be the first on the scene to get what we wanted. Every time one came down, we'd start figuring how many others, grounded for lack of parts, we could put back in the air. Every outfit in the area was doing the same thing, taking parts off one plane and putting them on another. I've sat in a plane we fixed up, revving the engines just before it was to be test-hopped, only to have a guy from another squadron come crawling over the cockpit with a screw-driver, planning to take out some instrument or other!"

Like other Air Service Command repair squadrons, Stuart's is a tight little entity, prepared to handle almost every emergency job connected with aircraft and parts. Most of the men have been overseas for almost two years and have learned the hard way how to forage for equipment and make their own when necessary.

(Continued on page 134)



Parts for this Liberator undergoing repair at New Guinea base come from salvage expeditions to the "bone yard."

During factory rest periods, women employees can sun selves on beautifully landscaped grounds. Del Mar Turf Club was one of most palatial race tracks in country.

Women metal workers at Del Mar. Ninety per cent of factory employees are women.

RACE TRACK PRODUCTION LINE

By HAROLD KEEN

Aviation Editor, San Diego Tribune-Sun

Bing Crosby's plush Del Mar Turf Club now houses factory making wing sub-assemblies for Douglas.

FOR more than two years, a ghostly quiet has shrouded the track, the stables, the grandstand, and the clubhouse of Bing Crosby's million-dollar Del Mar Turf Club, a palatial horse-racing emporium where the customers who lost their shirts were made to feel they had enjoyed a rare privilege, indeed.

Since Pearl Harbor, this Southern California shrine of the sport of kings has led a strange career never envisioned by its founders in 1936, but of all the uses to which it has been put, today's is the most unorthodox.

At various times following the outbreak of war, the establishment—"where the turf meets the surf" of the Pacific—has been a temporary refuge for soldiers and Marines. Now it's an aircraft parts plant, where hundreds of workers (90 per cent women) are fabricating wing sub-assemblies for the *Flying Fortresses* rolling off Douglas' lines at Long Beach.

Doom of the track for its original purpose, at least until victory, seemed pretty certain shortly after Dec. 7, 1941, when soldiers swarming to the west coast to guard strategic areas bedded themselves down at the Turf Club. Upon evacuation of the Army, the Marines moved in during the summer of 1942, and for six months leathernecks occupied the stables which once housed such expensive horseflesh as "Seabiscuit," "Ligaroti" and "High Strike". The devil-dogs, all from camps in the vicinity, remained Crosby's guests for six months, while they perfected their swimming ability in the surf.

And when the last Marine cleared out, leaving the Del Mar Turf Club once more a place through which echoed memories of high happy days of peacetime America, Bing and his cohorts—Pat O'Brien, Charles Howard (the Los Angeles auto distributor best known as the owner of "Seabiscuit"), and Kent Allen, Los Angeles attorney—had a problem on their hands. With no more apparent demand for its facilities from the military, would the Turf Club's board of directors figuratively wrap up the track and put it in storage for the duration?

Fred Poggi, factory manager.

At just about this time, gasoline rationing had been extended to the west, leaving the Del Mar enterprise in a particularly vulnerable position. The track is located 15 miles from one metropolitan center—San Diego—and more than 100 miles from another—Los Angeles. It appeared unlikely that fans any longer could afford the luxury of such fuel-consuming trips.

This also was the time—December, 1942, and January, 1943—when Southern California aircraft plants were stepping up production schedules to undreamed of proportions and becoming frantic for the help of subcontractors. The Crosby group levelled appraising eyes on the 500,000 square feet of floor space which could be made available beneath the grandstand and clubhouse, and in the San Diego County Fair exhibit buildings of California's 22nd Agricultural District, which had given the Turf Club a 10-year lease on the property in 1936.

It did not seem incongruous to Bing that a horse-racing track should be converted into an aircraft parts factory.

"That's what it'll be," he decided. "Where else in Southern California will a prime contractor be able to find so much floor space for sub-assemblies right now?"

The result is that today the Del Mar Turf Club, aircraft division, is doing an important war job. While silence still

(*Continued on page* 138)

Bad News for Nips

We are able to report exclusively that photographs of wartime Japan have been taken from a *Flying Fortress*. Until now, *Fortresses* have never been reported within 1,000 miles of Tokyo. . . . Our source is an authority from United Air Lines who dropped in the other day to tell us about their modification center at Cheyenne, Wyo. He told about the early days of the center, how it was organized, and the modification of the first two *Flying Fortresses* to be handled there. It was a rush job and the boys spent a lot of time on it. Then our informant said: "It apparently was worth all the effort, because it later was learned that one of the planes was used to take the first aerial photographs of wartime Japan."

No wonder Tojo is telling the Nips to get ready for bombing raids!

Add Globalaundry

A friend of ours in the Navy tells us that Piper *Cubs* are now being used to help solve the international laundry problem. Seems they are based aboard aircraft carriers, nearly all of which now have at least one Piper on duty.

The *Cubs* are used for miscellaneous operations between the carriers and land and between carriers and other ships in radio-silenced convoy.

The operation of a *Cub* from a carrier in the harbor at Noumea was described to us. The big flat-top was in port and at anchor, her planes were ashore. But a *Cub* stayed on duty, faithfully flying mail and laundry back and forth. *Cubs* also served at other harbor bases.

At sea, take-offs and landings are on the carriers only—messages are dropped and picked up from the air in serving other units of the Fleet.

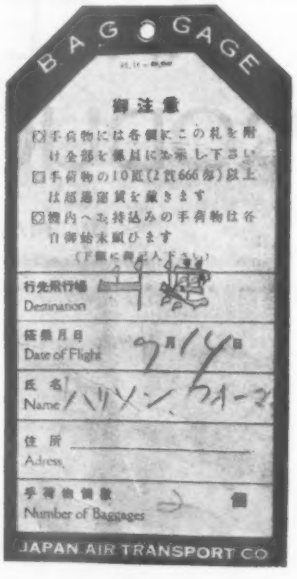
No See-um

One of FLYING's editors recently completed a 2,000-mile trip to the East Coast and back with a 6¼-inch Japanese airline baggage tag plainly visible on his brief case throughout the trip. Only one person spotted the tag of his own accord —a clerk in a Washington, D. C., store. This, despite the fact that it was clearly displayed as follows:

Airline personnel handled the brief case several times between Chicago and New York. In New York, the tag was visible to baggage handlers, taxi drivers and personnel in the offices of several aircraft manufacturers.

The case was handled by airline personnel between New York and Washington—again without being detected.

In Washington, it went unnoticed by hotel personnel, taxi drivers, guards in both the Army's Pentagon building and the Navy Department; in the latter building the contents of the bag were closely inspected by guards when entering and leaving the building. Only the aforementioned clerk spotted the tag without



The tag.

having it called specifically to his attention.

Returning to Chicago via New York, the FLYING editor continued to carry the tag in public and at no time was it noticed by airline or ground personnel. The tag itself, incidentally, was sent us several years ago by Harrison Forman, the explorer and war correspondent, who intended it for use as an illustration for an article he wrote for FLYING on Japan's airline operations.

Weather

With the Weather Bureau coming up almost daily with some new gadget to improve the accuracy of predictions, Mark Twain's famous crack about everybody talking about the weather but nobody doing anything about it would seem obsolescent if not obsolete.

Most noteworthy recent development is a method of measuring the height of cloud ceilings during the daytime by using a modulated light beam with a detector and recording equipment. Clouds as high as 20,000 feet have been measured by the new system, soon to be installed in 25 airports around the country.

Another development is an anemometer for measuring wind speed which is an improvement over former models because friction drag is eliminated and mechanical contacts in the electrical circuit have been removed.

Weather men have also figured out an improved method for measuring water vapor in the atmosphere. It is better than the old ones because it measures a lot of air at once, instead of by samples.

Test of the over-all improvement in predictions is word of transatlantic pilots, some of whom say that weather reports are so accurate these days that navigating is cut to a minimum. They now can tell where they are by checking a weather report on cloud formations.

Black-Out for Black-Outs

Current trends in Washington indicate that (maybe) War Department requirements that airlines pull their curtains during certain take-offs and landings will be junked. Stringent restrictions laid down early in the war have long since been relaxed, and early in the winter curtain black-out cities were reduced to four—San Diego, New York, San Francisco, and Oakland. It was further specified that curtains should be drawn if a convoy were sighted, if you were flying passengers around the Panama Canal, or if you were over a large Naval installation. How large an installation requires drawn curtains was left to the discretion of the pilot.

When—and if—the ban is lifted, it will mark the end of a war-long struggle in which the War Department stood firmly on leaning over backwards to insure security, and civilian spokesmen fretted under the black-out rulings.

"It seems absurd to suppose," said Welch Pogue, chairman of the Civil Aeronautics Board, more than a year ago, "that effective spying will be done in any such casual way as through the small window of an airliner. The real McCoy, if he uses air at all, will hire a local flivver of the air with flexibility of operation and no fixed routes to follow in which to make his observations."

Another black-out lifting that has

(*Continued on page* 154)

AFRICAN AIRLINE

By
JAMES GLASSCOCK

Formerly Junior Airport Manager,
Pan American Airways-Africa, Ltd.

Pan American Airways set up a 4,000-mile airline across Africa to Cairo in 60 days.

SHORTLY before the United States was forced into the war, President Roosevelt requested Pan American Airways to set up an airline across Africa to speed the delivery of planes and supplies to the sorely pressed British in the Middle East.

In September, 1941, 60 days after receiving the request, Pan American Airways-Africa, Ltd., had the airline in operation—a skyway-blazing route of more than 4,000 miles from Africa's west coast, through the heart of the great continent, to the terminus at Cairo. PAA-Africa frequently flew a million miles a month along this route.

This pioneering work enabled the U. S. Army Air Transport Command to take over a full-fledged airline little more than a year later—in October, 1942.

The British Overseas Airways Corp. has reported that all expenditure under RAF and U. S. Army orders is being borne by the British government. Some expenditures under PAA instructions were borne by them as a charge to the British Lend-Lease account but all liabilities outstanding at the time of PAA's transferring the route to the U. S. Army have been taken over by the British under "reciprocal aid." Many services and supplies are being provided for the U. S. Army under the plan for reciprocal aid. Since June, 1940, the costs of construction and expansion borne by the British have totalled from $6,000,000 to $8,000,000.

Pan American already had a *Clipper* route from the United States to South Africa via South America; Freetown, Sierra Leone, British sliver of land on Africa's west coast; Lagos, Nigeria; and Leopoldville, Belgian Congo.

The new African line, however, was

Pan American Boeing Clippers connected with African land route on west coast.

purely a landplane undertaking and a great fleet of Douglas DC-3's (some coming from domestic airlines in the States) was put into operation.

Tons of equipment ranging from mosquito boots to Diesel power plants were transported to Africa by boat and dispatched over the continent to forge the aerial artery. Large numbers of natives were hired to level landing areas, build hangars, barracks, office buildings and roads.

A great army of ground men was moved to Africa, most of them by boat through sub-infested waters, to keep the airline functioning smoothly. They came from other divisions of Pan American and from hundreds of other firms. Before leaving New York they were innoculated for yellow fever, typhoid, cholera and tetanus, and vaccinated for smallpox. They wore khaki uniforms, distinguished from the Army by a blue PAA symbol above the left shirt pocket.

There were pilots, operations men, mechanics, sheet metal workers, stockroom clerks, doctors, dentists, cooks, auditors, electricians, carpenters and even librarians (who also could screen movies for the Pan-Africans).

The line's western terminus was set up at Fisherman's Lake near Monrovia, capital of the little Negro republic of Liberia. Both marine and ground landing bases were established here.

The company's headquarters were located 821 miles to the east at Accra, Gold Coast, the small British colony on the Gulf of Guinea which is surrounded by the French Ivory Coast.

From Accra, the route jumped east to Lagos, on the coast of Nigeria; northeastward to Kano, Nigeria; east again to Maiduguri in Nigeria and Fort Lamy in French Equatorial Africa, which fortunately was under the control of the Fighting French; over to Khartoum in the Anglo-Egyptian Sudan and finally north to Cairo, the eastern terminus.

Flights were made later from Cairo to Karachi, on India's west coast, by way of Aden on the tip of the Arabian peninsula, and to Baghdad and Basra in Iraq and to Tehran, Iran.

There were two phases of PAA operations in Africa. Pan American Airways-Africa, Ltd., flew DC-3's from Liberia to Cairo, carrying passengers, mail and cargo, while Pan American Air Ferries flew bombers from the United States to the Middle East over PAA-Africa's routes.

Boeing *Clippers* on regular flights out of New York and on shuttle flights from Natal, Brazil, unloaded their high priority passengers and cargo at Fishlake (contraction for Fisherman's Lake adopted by the men). The load was then transferred to twin-engined Douglas *Skytrains* at a small landing field scraped out of the green jungle about three miles from the marine base.

A larger, well-equipped field was constructed later at Roberts Field, 76 miles south of Fishlake, with the aid of U. S. Army engineers, including a large contingent of Negro troops. The field is located near the large Firestone plantations.

The line was divided into two routes: the Accra-Fishlake run to the west, and the Accra-Cairo flight to the east.

The first stop on the western route after Roberts Field was Takoradi, the big RAF base on the Gold Coast, 120 miles west of Accra. Pilots avoided flying over the French Ivory Coast separating the two stations because it was then under the control of the Vichy French and they preferred not to take a chance on being greeted by ack-ack.

Accra was the center of all operations and cargo and passengers going either east or west were re-routed here.

The Accra-Cairo route went to Lagos, another over-water jump to skip the Vichy French territory; Kano and Maiduguri, in the northeastern part of Nigeria; Fort Lamy; El Fasher and El Obeid, two optional stops in the Anglo-Egyptian-Sudan; Khartoum and Cairo.

Transcontinental and Western Air also brought in passengers and cargo to Accra, flying from Natal by way of Ascension, the little British island in the middle of the South Atlantic where the planes were refueled. TWA's Boeing *Stratoliners* made the Natal-Ascension-Accra flights about twice a week. Subsequently, PAA flew Douglas *Skymasters* over the same route.

Planes returning from India and Cairo carried ferry pilots, mica, mail and occasionally Jap rifles or other enemy equipment captured in the Far East. At Accra they either were assigned to a *Stratoliner*, a *Liberator Express*, or were sent to Fishlake to pick up a *Clipper* for the trip home.

Three large steel hangars were built at Accra where the transports were serviced and overhauled. Regular engine checks and changes were made here. The field was built originally by British Overseas Airways Corp., but had to be enlarged by Pan American. Runways were lengthened, the little administration building enlarged and other office structures added. A dispersal area for bombers and fighters being ferried across country was located a few hundred yards south of the field.

A large camp to house PAA-Africa's personnel was built about three miles from the airport. Screened-in barracks, mess halls, recreation halls, laundry, power plant and warehouses were built.

While the other stations over Africa had smaller establishments, they often had better facilities and better food than Accra.

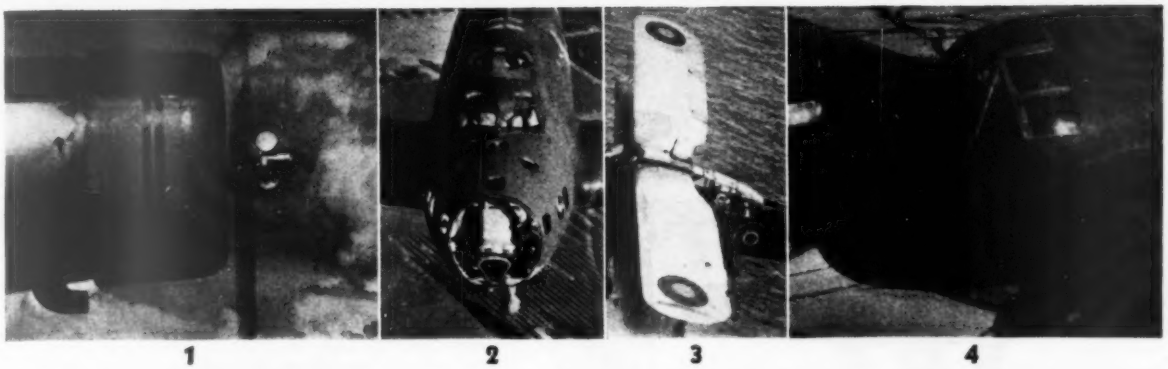
Pan American drew heavily on native labor wherever possible. They cleared fields, smoothed runways, built office buildings and barracks, ran the laundries, kept the barracks clean, cooked and even did office work. Some of the Negroes at Accra had attended the English schools on the Gold Coast, noted for its educational system, and were good office helpers. Many knew shorthand and were good at typing. Others ran mimeograph machines, helped to sort mail and even drew maps.

Regular scheduled flights on the two African routes were maintained daily, just as in the States. There were many extra-scheduled flights as traffic increased. Runs which departed from the regular route were listed as special charter flights.

(*Continued on page* 164)

Douglas DC-3 that formerly flew for a domestic airline is serviced on African airfield by Pan American crew.

FOR IDENTIFICATION



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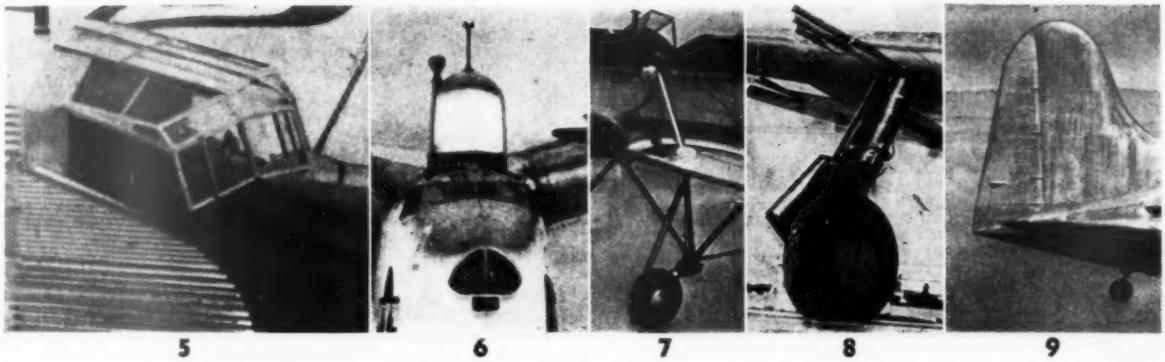


5 6 7 8 9

The planes are: 1. Vultee Valiant; 2. Boeing Flying Fortress; 3. Fairey Albacore; 4. Bristol Beaufighter; 5. Junkers Ju-52; 6. Martin Marlinert; 7. Ryan Recruit; 8. Republic Thunderbolt; 9. Boeing Stratoliner.

MISTAKEN IDENTITIES

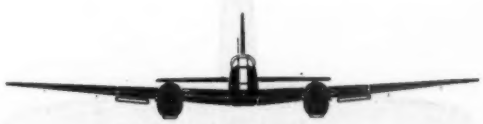
DANGEROUSLY similar at a glance, the DeHavilland *Mosquito* and Messerschmitt Me-210 (the Me-410 is the Me-210 with large engines) should be carefully studied. Both perform similar duties for their respective air forces. Silhouettes are to exact scale.

Copyright, FLYING, May, 1944.

DeHavilland Mosquito.

Messerschmitt Me-210.

Mosquito wing span: 54 ft. 2 in.



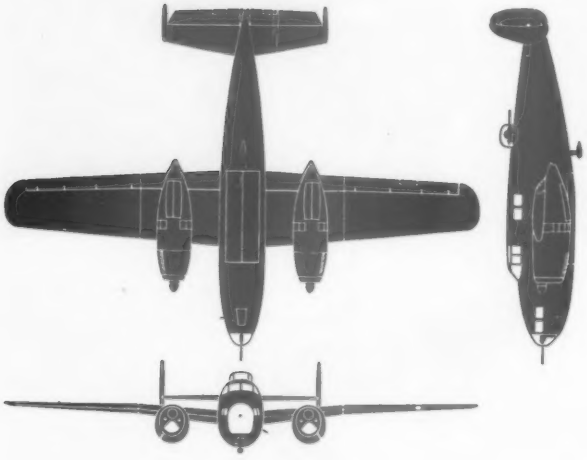
Me-210 wing span: 52 feet.

Mosquito length: 40 ft. 9½ in.

Me-210 length: 40 ft. 3 in.

FAIRCHILD GUNNER

Trainer



PERTINENT FACTS: One of the Army Air Forces current gunnery trainers, the *Gunner* (technical designation: AT-21) is a tricycle-geared, mid-wing monoplane, powered with two 520 h.p. air-cooled inline Ranger engines. Top speed is 210 m.p.h., cruising speed, 184 m.p.h. Service ceiling is 20,400 feet, normal range, 736 miles. Gross weight is 11,713 pounds. Wing span is 53 feet, length, 37 ft., 7 in.; height, 15 feet. The *Gunner* is manufactured by Fairchild and Bellanca.

WHAT TO LOOK FOR: The wing is moderately gulled in the center section, is fully cantilever and tapers slightly. The engines appear to be liquid-cooled, but actually are inline and air-cooled. The fuselage (made of Fairchild's plastic Duramold) is oval, tapering back to the twin tail unit.

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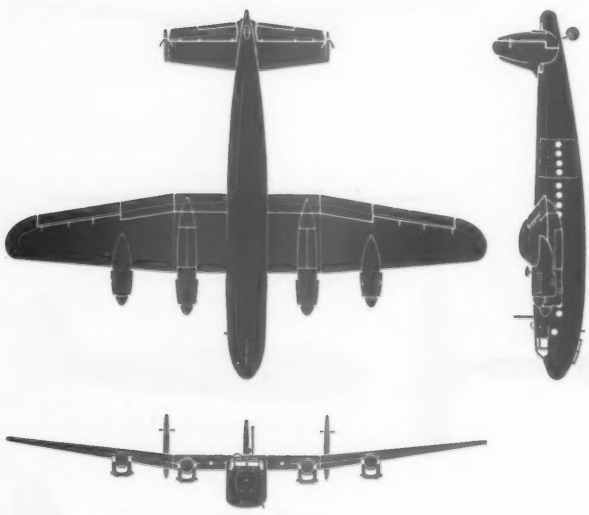
AVRO YORK

Transport



PERTINENT FACTS: Newest British transport in operation, the *York* was developed from the *Lancaster* bomber. It follows the same general lines, although the fuselage has been completely redesigned. Powered with four 1,260 h.p. liquid-cooled *Merlin* engines, the *York* can carry a load of 10 tons 500 miles. It can carry about 50 passengers. Wing span is 102 feet, length, 78 ft. 6 in.; height, 16 ft. 6 in. Cruising speed is 220 m.p.h. A second version of the *York* is reported to be powered with four 1,600 air-cooled *Hercules* engines.

WHAT TO LOOK FOR: A high-wing monoplane, the *York's* wing has a flat center section with considerable dihedral in the wing panels. The fuselage is deep and square. The tail is modified slightly from that of the *Lancaster*, having the two rudders and an extra center stabilizing fin. The tail wheel does not retract.

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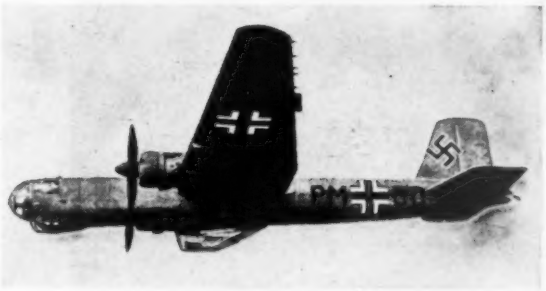
HEINKEL He-177

Heavy Bomber



PERTINENT FACTS: This airplane was intended to be the German answer to the American Flying Fortress and British Lancaster. But ever since its first flight early in 1940, the He-177 has given the Germans trouble. Though it appears to have two engines, the He-177 actually has four—two pairs of coupled 1,350 h.p. liquid-cooled engines. Wing span is 103 ft. 5 in.; length, 66 ft. 6 in.; height, 18 ft. 2 in. Top speed is 280 m.p.h. at 19,000 feet. Maximum range is reported to be 7,040 miles, gross weight 41 tons. Armament consists mainly of 13 mm. machine guns.

WHAT TO LOOK FOR: The He-177 is a mid-wing, cantilever monoplane, with rectangular center section and tapering wing panels. The two engine nacelles look like they house two radial engines. The fuselage is circular; there is no protruding cockpit, the pilot sitting in the glassed-in nose in the same manner as in the old Heinkel He-111. The conventional tail unit is squarish and cantilever.

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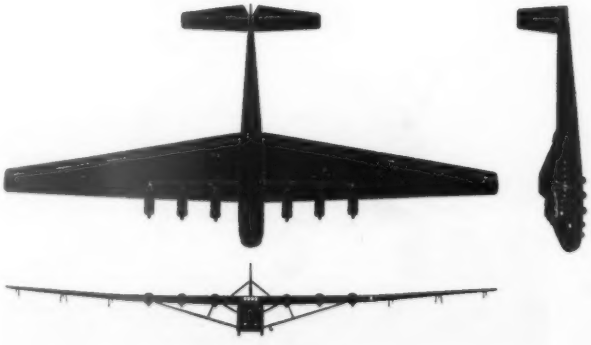
MESSERSCHMITT Me-323

Transport



PERTINENT FACTS: One of the most-discussed enemy aircraft of recent months, the Me-323 (called the "Giant" by the Germans) is a six-engined transport based on the old Me-321 glider. The six engines are French Gnome-Rhone radials of 950 h.p. each. Top speed is 170 m.p.h., range about 600 miles. Span is 181 feet, length, 93 ft. 4 in.; height, 24 feet. It carries a crew of five and 120 armed soldiers. Gross weight is about 65,000 lbs. Although armed with up to 18 7.9 mm. machine guns, the Me-323 proved one of the most vulnerable airplanes the Germans ever had; they are rarely seen anywhere near a combat zone any more. Structural provision is made for rocket-assisted take-offs.

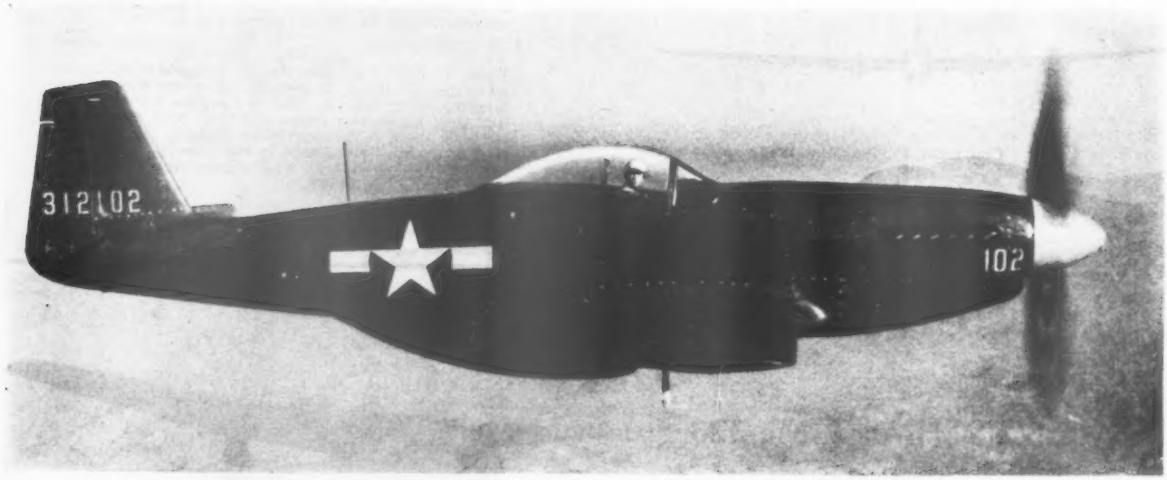
WHAT TO LOOK FOR: A high-winged, externally-braced monoplane, the Me-323 has an almost straight leading edge, sharply tapered trailing edge and blunt tips. The fuselage is square, tapering back to the tail. Cargo is loaded through the nose. There are 10 landing wheels. The tail is rectangular, also externally braced.

Copyright, FLYING, May, 1944

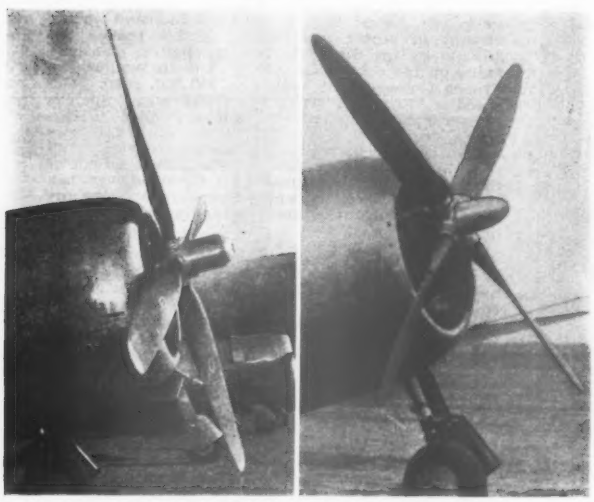
HAVE YOU SEEN?

Inspired by the famed Navy Buaer bungler, Dilbert, this jacket is worn by carrier deckmen who pull serious boners.

Another British version of what the new Jap fighter "Tony" looks like is this from the Aeroplane Spotter. Bulges under wing probably are cannon.



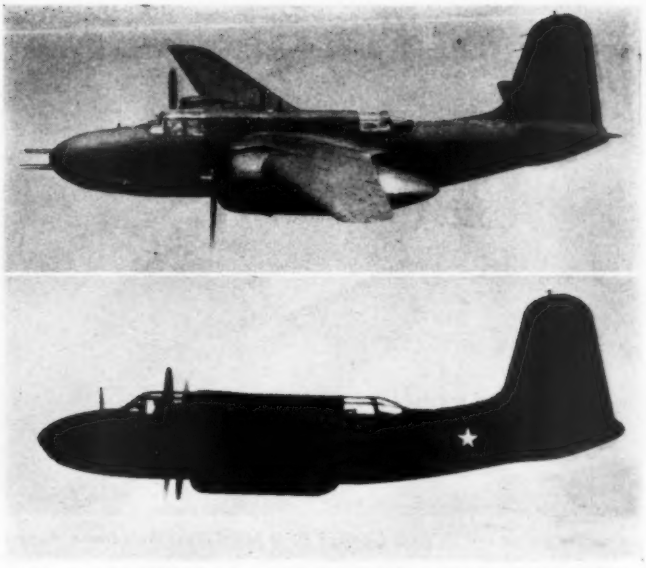
Newest modification of the Mustang now in production has a completely redesigned cockpit canopy giving the pilot excellent visibility in all directions. Though later than the P-51B, this model also is powered with the 1,520-h.p. Merlin engine



Four-bladed Hamilton Standard propellers (left) now are installed on Thunderbolts. Curtiss props (right) also are on Thunderbolts.

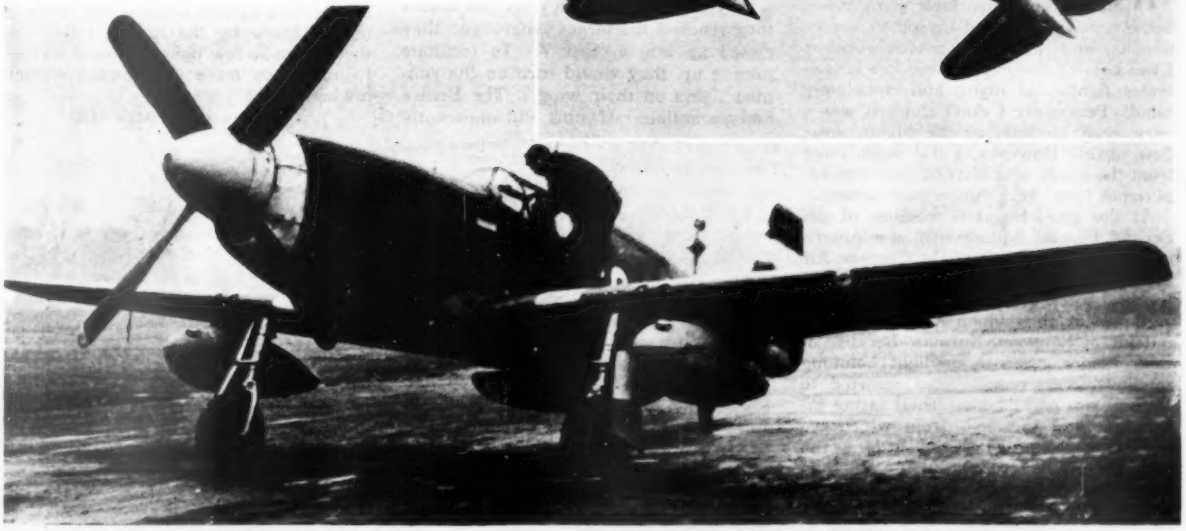
Commonwealth Boomerang, new Australian-built fighter, looks strongly like North American design. Wing span is 36 ft. 3 in.

This is a model of the newest modification of the Liberator for the Navy. It has single rudder, two top gun turrets.



Airplane at top originally was announced as P-70, actually is a late modification of the A-20 with cannon in the nose. Lower picture is of the real P-70, with short nose and four 20-mm. cannon probably in bulge under the fuselage.

↑ This model is on desk of president of Lawrance Aeronautical Corp., Linden, N.J. It resembles Helldiver, is single-seat and mid-wing, has four-blade prop and unusual tail section.



Two of the long-range fighters escorting Army Fortresses and Liberators to Berlin and back are the Thunderbolt (inset) and Mustang. These pictures show the wing fuel tanks that make such long flights possible. Tanks are dropped in a fight or when empty.

The author and his AVG Curtiss P-40 at Mingladoon Aerodrome, Rangoon, Burma.

I Learned About Flying From That!—No. 56

By PETER WRIGHT

Now flying the Atlantic for American Export Airlines; former member of Chennault's AVG in China.

The misguided good intentions of a friend came close to writing "finis" to this pilot's career.

"ANY landing you can walk away from is a good landing" has been an aviation proverb for many years. Some time ago I found myself in a very unusual and none too envious position. I was coming in for a landing in a single-seater fighter, at night, and completely blind! Personally I don't think it was a very good landing, as the plane never flew again. However, I did walk away from the crash, and learned from my experience one very important lesson.

At the time, I was a member of the Second Pursuit Squadron of the American Volunteer Group of the Chinese Air Force under General Chennault. During the first week of January, 1942, we were stationed at Mingladoon Aerodrome, just outside of Rangoon, Burma. Because of their heavy losses in daylight bombing missions, the Japanese had resorted to hit and run night raids. Their target invariably was the field from which we were operating. They did little or no damage, as the coolies quickly filled in any lucky hit made on the runways. However we did lose a great deal of sleep, so some of us got together and decided to try some night fighting.

The Japanese would generally send over a small formation of either five or seven single-engined bombers. They flew a very ragged formation until just before they reached the target, whereupon they closed up into a tight V. To facilitate joining up, they would turn on the running lights on their wings. The British had no antiaircraft guns and apparently the Japs were not expecting any night fighters. We felt that if we could get one of our Curtiss P-40's into the air, it would be quite easy to bag a bomber or two, especially if they kept their running lights on.

The big problem for us was landing at night. We had absolutely no facilities for night flying. However, with the help of the British we obtained eight kerosene lanterns. Six of these were white and two red. We arranged that when the pilot gave the recognition signal, a man would drive out in a jeep and place the lanterns on the runway. We dared not use too much light in case there were enemy fighters in the vicinity. Many of us thought longingly of the old days in the States when you could push a button and the runway lights would go on or off in a flash.

We decided to use only one plane at a time. This would eliminate the danger of collision at night, and besides the small force of enemy bombers was just the right size for one plane to handle. It was up to each pilot to make his own arrangements of the runway lights, as everyone had a slightly different idea of how he wanted them placed.

On the second night of our operations, I found myself chosen as the pilot. I took J. B. Hauser, my mechanic, aside, and worked out our system of lights for the night. On the signal that the enemy was coming, he would hop in the jeep and drive to the far end of the runway. Using his headlights as a marker, I would attempt as straight a take-off as possible. When I was ready to land, I would flash my running lights while circling the field at 2,000 feet. I decided to use four white lights on the left side of the runway, and the other two on the right side. The two red lanterns were to be placed at the downwind end of the runway, and I would land just over them. I impressed on him carefully that this system *must* be strictly adhered to and that I did not want any extra lights. I also told him that if there should be any change in the lighting system while I was flying to let me know by the radio. I felt that there were so few lights it would be confusing if any more were added without my knowledge.

(Continued on page 164)

The wreck the author "walked away from" after his blind and obstructed landing.

ARBORTOWN'S PARK BECOMES AN AIRPORT

The mayor and almost every citizen of small, wide-awake Arbortown wanted an airport. They knew their flying sons and daughters in the Service, and countless others, would want to fly after Victory. They realized that landing facilities promised a prosperous future for Arbortown.

So a section of the park has now been converted into Arbortown's own airport—conveniently located to the town! Arbortown is ready for the coming air age! After Victory you can land there and at thousands of other progressive towns in your peacetime Piper Cub.

Is your town ready to offer the convenience of landing facilities? If not, it should plan an inexpensive landing strip or airport now—for its citizens and its future! A new booklet, "What Your Town Needs for the Coming Air Age", gives the why, where and how of building landing facilities. For your free copy, write Piper Aircraft Corporation, Department PA54W, Lock Haven, Pennsylvania.

GET YOUR AVIATION BOOKLET—"Piper Cub . . . In War and In Peace." Full color, 32 pages. Covers history of light plane, Piper Cub planes, coming air age, how to fly. Enclose 10c in stamps or coin for postage-handling. Write Piper Aircraft Corporation, Department PA54, Lock Haven, Pennsylvania.

16mm. SOUND FILM—"The Construction of a Light Airplane." For distribution points write: Supervisor, Audio-Visual Aids, Extension Services, Pennsylvania State College, State College, Pennsylvania.

PIPER *Cub*

Points the Way to Wings for All Americans

AIRCRAFT OWNERS AND PILOTS ASSOCIATION

AOPA NEWS

The Aircraft Owners and Pilots Association (AOPA) with National Service Office located in the Carpenters Bldg., Washington, and Registrar's Office in the Michigan Square Bldg., Chicago, is a non-profit organization composed exclusively of pilots. It looks after the pilot's best interests in all phases of aviation and helps individual pilots with their individual problems. The AOPA operates with a full-time professional staff and is the largest group of civilian pilots in the world. This column is edited by the Aircraft Owners and Pilots Association and opinions contained in it are not necessarily those of FLYING. A special Bulletin is sent each month to all registered AOPA pilots and also confidential memorandums from AOPA's Washington staff are sent members from time to time.

A REPORT has been sent to the Civil Aeronautics Board incorporating the viewpoint of AOPA pilots on the subject of revising CAR Part 60, Air Traffic Rules. The number of pilots responding to *Cockpit Clatter* (AOPA's confidential newsletter to members) was far in excess of the returns from any previous questionnaire sent to AOPA pilots. The three pertinent points which AOPA's report covers, and on which there was almost unanimous agreement, are as follows:

1. The proposed revisions are generally in the right direction and should be adopted, plus an even further reduction in the number and complexity of rules.

2. The weather minimum of 1,000-foot ceiling and three-mile visibility should not be made to apply to airway air space and the existing requirement for this minimum within air-traffic-control zones should be reduced to 1,000-foot ceiling and one-mile visibility. Weather minimums for contact flight outside of the airport control zone should be reduced to 500-foot ceiling and one-mile visibility.

3. The "reckless flying" rule should be clearly set forth to prevent the possibility of malicious abuse. On this latter point pilots believe the rule should replace a number of specific requirements still carried in the proposed redraft of Part 60.

THE GHOST WALKS AGAIN

The CAA has hauled out for the fifth time a proposal to multiply the number and types of mechanic certificates. This proposal has been opposed by pilots in the aviation industry and successfully discouraged several times over the past four years. It calls for the breakdown into various classifications of all of the various types of jobs connected with the maintenance and overhaul of aircraft and aircraft engines. The plan would provide different types of "tickets" to persons who had proven their ability to straighten out a cowling, change a spark plug, or put a patch on an airplane.

This proposal would be accomplished at large centers and probably would be a great boon to large mechanic schools, but the small airport, with its one hangar, limited facilities and private pilots, it is felt, would be greatly inconvenienced.

Fundamentally, a good mechanic shop attracts customers and a sloppy shop soon finds it has no business. AOPA doubts that adoption of complicated licenses would guarantee good workmanship and it certainly would not make the job of repair and overhaul either more convenient or cheaper. Many pilots have raised the question as to whether minor repairs and adjustments could not be accomplished by aircraft owners and thus avoid the requirement to have a certificated mechanic sign the log entry. Oftentimes a special flight of 100 or more miles is required.

THE BIG TWO

In the hundreds of pieces of mail received by AOPA each month from licensed pilots, the AOPA staff is able to compile an interesting cross-section of pilot opinion as it relates to current aviation projects. In fact, this is the manner in which AOPA's staff formulates general policies and determines action programs in behalf of its pilot members.

Two hard and fast requests have recurred week after week and with increased rapidity recently. The first of these is a plea for AOPA action to reduce the number of and make less restrictive and confusing the regulations relating to operation of civil aircraft. The second is a marked interest in the airport program which will consider primarily the needs and requirements of small private-type aircraft.

In particular, the number of requests for information regarding requirements and construction details for private airports is very encouraging. In addition to standard information available from the Airport Section of CAA, which, however, pertains mostly to large commercial-type airports, Piper Aircraft Corporation has recently issued an interesting booklet entitled, "What Your Town Needs for the Coming Air Age," which concerns itself with highway and T-shaped landing strips. In it will be found interesting and helpful information for those who plan private airports for their towns or cities.

Accordingly, AOPA is elaborating on its air address and landing area program, including the "Airhaven" idea introduced some two years ago. Future editions of the AOPA *Pilot* and *Cockpit Clatter* will send additional information regarding these subjects to AOPA members.

LOST MEMBERS

We are holding mail for the following AOPA members whose correct addresses are not known to us. Anyone knowing their present whereabouts please notify the AOPA Registrar, Michigan Square Bldg., Chicago, Ill.:

E. W. Barker, AOPA 1042
Weldon H. Beck, AOPA 8191
Dale E. Bradford, AOPA 8322
Charles O. Bradsher, AOPA 8990
Albert Douglas Deverich, AOPA 9651
Willet Foster, AOPA 16
Charles O. Green, AOPA 10135
J. H. Harper, AOPA 7974
Merle Ruckman Heil, AOPA 9913
Max C. Jones, AOPA 4861
Charles F. Kimbley, AOPA 9924
P. E. Littlefield, Jr., AOPA 9605
Earl William Newton, Jr., AOPA 9336
Lt. G. E. W. Scudder, Jr., AOPA 1948
Russell E. Skeen, AOPA 9529
Sgt. W. G. Spurlock, AOPA 3185
Col. A. H. Stackpole, AOPA 31
Stanley Tanabaum, AOPA 8995
Edward A. Ulco, AOPA 9209
William W. Vaughn, Jr., AOPA 8660
Mrs. W. L. Weyand, AOPA 3078

LEGISLATIVE MILLS GRIND

While discussions of the Lea Bill brought forth long and sometimes bitter arguments, it is surprising to find that little or no thought has been given to the less obvious legislative halls within the 48 states. Last year alone some 271 separate regulations concerning control, licensing, and taxing of aviation within state boundaries were passed in state legislatures. This year's crop of proposed state legislation tops anything now on the books.

AOPA is concerned over the great inconsistency of some of these proposed measures. A confidential report is being drawn up for circulation to members.

Two examples of the type of legislation which AOPA believes pilots should give thought to are given in the following two paragraphs. The first relates to Minnesota and the second to Alabama.

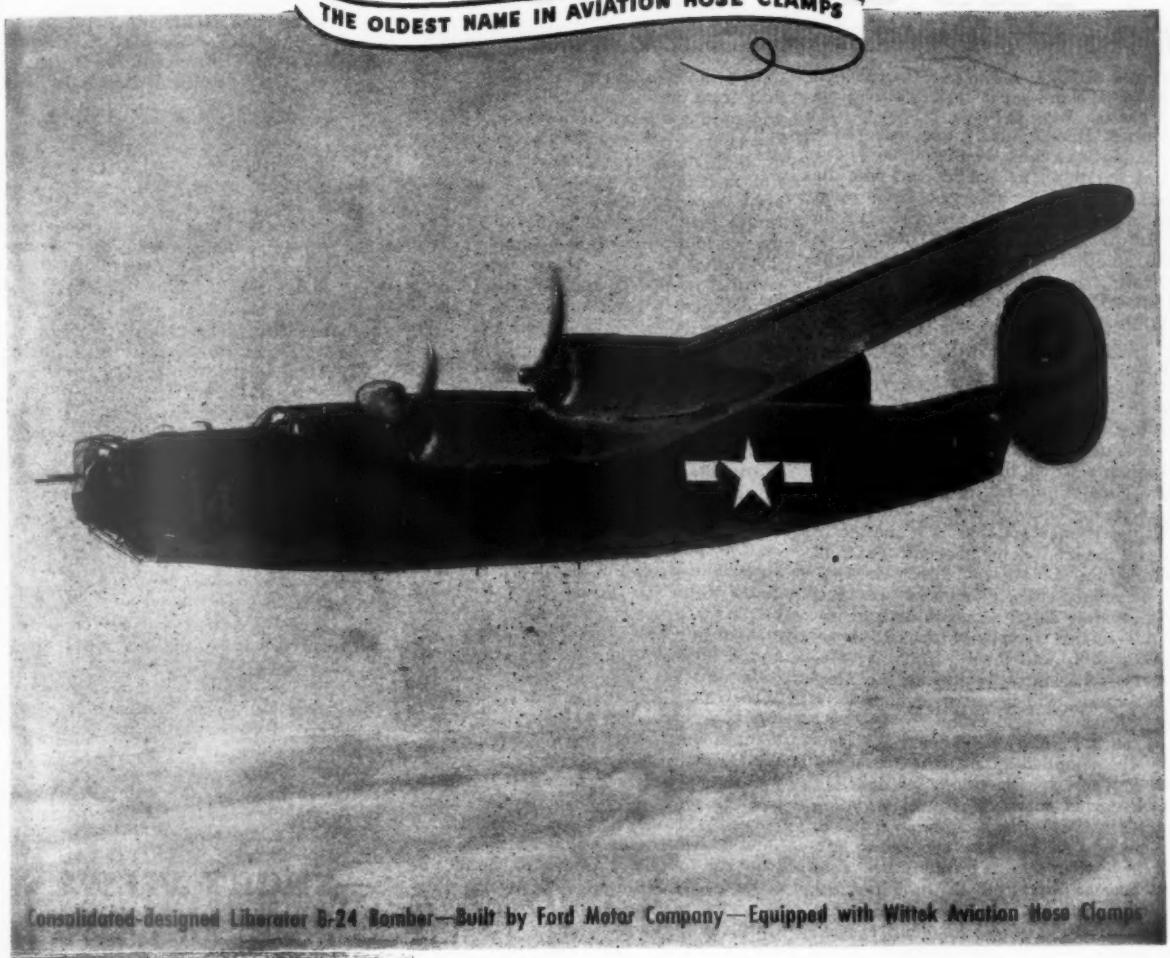
Minnesota: House Bill 1386, Chapter 653, Laws of 1943, Section 5, Subdivision 3, provides that "the commissioner shall, and is hereby empowered, to issue restricted licenses or register licenses . . . for the limited operation of non-commercial aircraft as hereinafter provided." A method for fixing the amount of fees is stipulated with the proviso, however, that such fees "shall not exceed $15 for any two-passenger aircraft or $50 for any aircraft . . ."

Alabama: House Bill 57, Governor's No. 248, Laws of 1943, Section 12 of this act, entitled "Certificate of Registration and Approval; Fees," sets up duplicate machinery to that operated by CAA and provides for the annual issuance of a $1 airman certificate, a $3 single-engined aircraft certificate, a $5 multi-engined aircraft certificate, a $10 fixed-base operator certificate and a $5 certificate for "each annual transient or individual operator or individual instructor . . ."

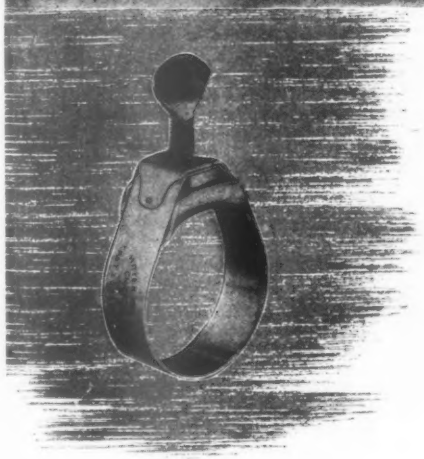
The battle to simplify Federal legislation is progressing reasonably well. It would be unfortunate indeed if in the midst of this chore we became lashed to the ground by a pyramiding structure of state regulatory laws, particularly those involving licensing and taxation as exemplified in the foregoing two paragraphs. END

WITTEK

THE OLDEST NAME IN AVIATION HOSE CLAMPS



Consolidated-designed Liberator B-24 Bomber—Built by Ford Motor Company—Equipped with Wittek Aviation Hose Clamps



Teamwork For Victory

Growing up from "a wing and a promise," the Consolidated Liberator B-24 Bomber, today one of the fastest and greatest weight carrying bombers in the world, is equipped with Wittek Aviation Hose Clamps. The dependability of Wittek Hose Clamps, long accepted by the aviation and automotive industries, is now being proven in actual service with the armed forces of the United Nations as standard equipment for aircraft, tanks, jeeps, trucks, ships and other combat vehicles. Wittek Manufacturing Co., Chicago 23, Ill.

ARMY E NAVY

War Bonds for Victory—
Buy MORE in '44!

WITTEK Aviation HOSE CLAMPS

THE LIBRARY

THE AIR FUTURE: A Primer of Aeropolitics; by Burnet Hershey; published by Duell, Sloan & Pearce. Price $2.75.

Burnet Hershey has done more than write an extremely enlightening book about aviation: he has delved into its past intelligently, observed its present and speculated with keen foresight on its future. The result is a book that is sane, stimulating and provocative. In its entirety it is a blueprint for a new way of life—if you will tolerate the phrase.

While aviation today is blasting a road to victory, it has within it the seeds from which a future world order—or disorder—will grow. If the power of aviation in the air future is to be harnessed for the greatest good of the greatest number it is obvious that its control will have to rest with a strong international organization. Thus the air future is one that will be anathema to isolationists.

"International aviation is a matter of give and take," a member of the Civil Aeronautics Board told Mr. Hershey. "If we expect to get anything we must be prepared to give something in return." If this reciprocity is effective—and certainly the theory is not revolutionary—aviation, according to Mr. Hershey's thesis, will be a tremendous force for peace and world order.

In the 258 pages of his book, Mr. Hershey has compiled an amazing amount of tightly written information. He develops his theory in sound sequence. Aviation unfolds from the days of the Wrights to the present in brilliant panorama. Mr. Hershey, when talking of the future, does not become involved in pseudo-scientific blueprints but any discussion of what tomorrow holds cannot help but contain the germs of a Wellsian fantasy. There is a blueprint of a brave new world in terms of distance shrinkages and scientific advances, but thanks to the restraint of the writing and the factual basis of the book the air future pictured seems nothing but logical.

This layman reviewer knows flying only from the viewpoint of the passenger and as a frequent reader of the magazines. Scientifically I cannot take issue or pass upon the author's knowledge. But from the viewpoint of the airplane as a tremendous political factor of the future that can bring peace or chaos to the world I am willing to proclaim that the author has done a brilliant job and one that needed doing. It would be folly to consider a post-war world without studying the tremendous role that aviation will play.

ERNEST VON HARTZ
Cable Editor
The Chicago Sun

GLIDERS AND GLIDER TRAINING, by Emanuele Stieri; published by Duell, Sloane & Pearce, Inc., New York, in 1943. 118 pp. Price $3.

Mr. Stieri's excellent book, described as, "A picture history as well as an authoritative handbook of gliders and glider training," is just that. It should be placed in the hands of every aviation-minded boy or girl over 10 years of age and of all similarly minded adults.

Reminiscent of Octave Chanute's "Progress in Flying Machines" (1894), this book brings the history of motorless flight down through the use of gliders by the Germans as training media for their war-time aviators, to their use in current warfare.

Stieri's book is a veritable textbook on "how to learn to fly a glider". Youngsters who can obtain a glider or build one could easily learn to fly it by carefully following the directions here given. An excellent chapter on air currents, winds and clouds, and their effect upon gliding and soaring, together with other interesting chapters, furnish the reader with much useful collateral glider information.

Despite many misspellings—and a number of omissions and errors—crediting Lilienthal, a German, with the first glider record when in fact it was made by our own John J. Montgomery seven years earlier; and failure to mention the Russian glider developments later adopted by the Germans—this is decidedly a worthwhile book, well printed and excellently illustrated. Stieri's illustrative sketches amplify the clarity of his text.

CHARLES T. MALONE
Major, Army Air Corps

THE HELICOPTERS ARE COMING, by C. B. F. Macauley; published by Whittlesey House, McGraw-Hill Book Co., New York, in 1944. 165 pp. Price $2.

An authentic compilation of facts and theories concerning the helicopter and its development has been needed for some time, and the new volume by Macauley comes close to satisfying this need. The author, assistant director of public relations of Fairchild Engine & Airplane Corp., approaches his subject with the perennial enthusiasm of the air-minded, but at the same time points out some pitfalls and problems ahead.

From the point of view of the general public, Macauley hits the spot, but the technically-minded will find it far from satisfying, for despite the author's explanations, the functioning of some parts of the helicopter, such as the cyclic pitch mechanism of the overhead rotor, remain unclear.

Of particular interest is the historical perspective, which brings out the fact that despite earlier development of successful rotating-wing craft, it remained for Igor Sikorsky to produce the first model to receive military recognition. The author's attempt to paint a picture of future air traffic control with thousands of helicopters darkening the skies is indeed brave, but it is difficult to believe that it will be as simple as he portrays.—D. G.

—SHORT VIEWS—

AN EDUCATIONAL GUIDE IN AIR TRANSPORTATION, by Ralph E. Hinkel and Leo Baron; published by Transcontinental and Western Air, Inc. in 1943. 140 pp. Price $0.75.

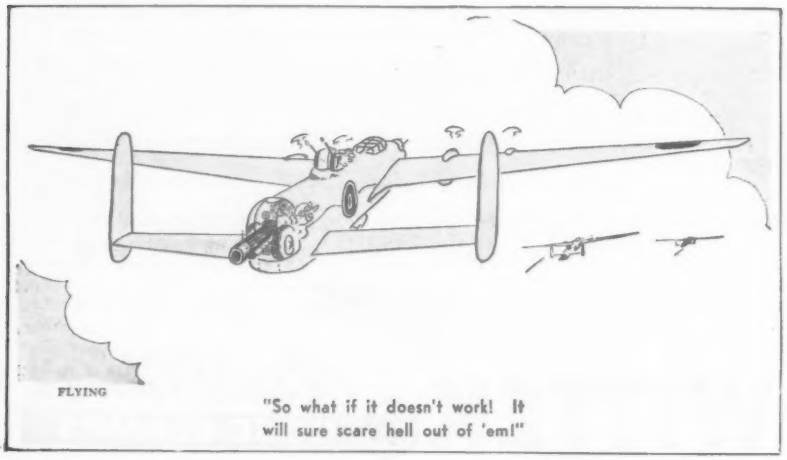
Primarily a vocational guide for those who wish to have a career in aviation, this illustrated book also contains a brief history of aviation and its post-war possibilities. A chart of each type of position in air transportation gives working conditions, pay, and necessary qualifications and training as well as a brief description of the duties of each job. Included is an up-to-date bibliography.

JOE FOSS, FLYING MARINE, as told to Walter Simmons; published by E. P. Dutton & Co., New York, in 1943. 160 pp. Price $2.50.

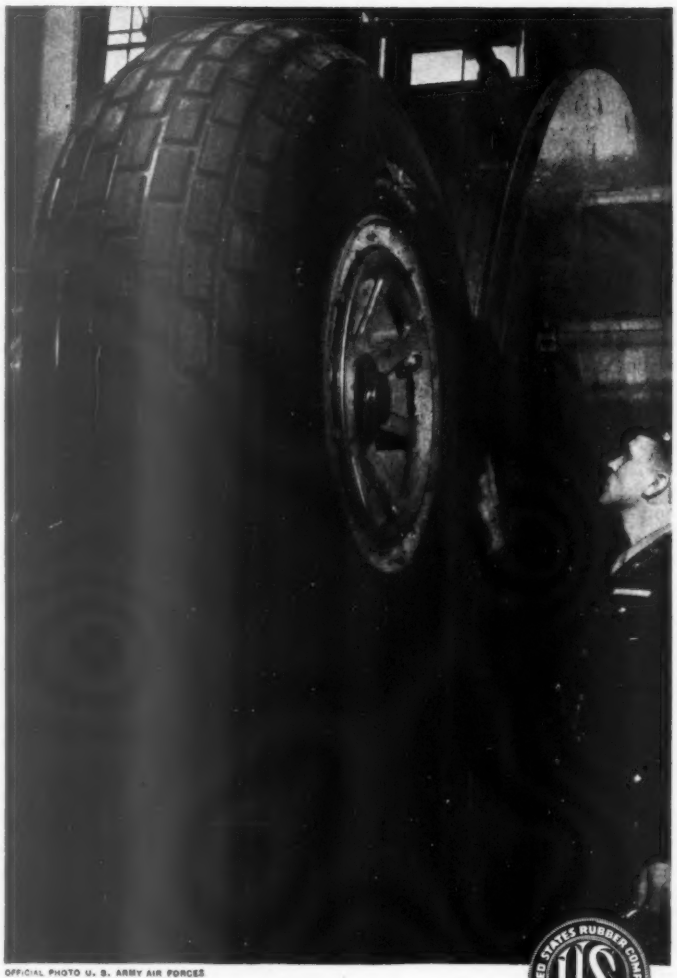
A first-person narrative of the famous Marine ace's life, from the time he shot his first BB gun through his exploits in shooting down 26 Japanese planes.

FLYING POWER, aircraft engines and their operation, by C. J. Hylander; published by the MacMillan Company, New York, in 1943. Price $2.

An elementary book by an instructor of long experience explaining how the engine operates.



"So what if it doesn't work! It will sure scare hell out of 'em!"



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Finding tomorrow's answers today

At Wright Field, the men and women of the A.A.F. Materiel Command are searching for answers to questions that may not be asked until tomorrow... The Army Air Forces must have the answers today.

In 1917, the War Department established an aircraft engineering laboratory and flying field at Dayton, Ohio. Since that time Materiel Command technicians from this field have worked hand in hand with airplane tire manufacturers to build lighter, stronger, safer tires.

Today, in the Materials Lab, they are testing cotton and rayon and nylon cords. On giant dynamometers they land synthetic rubber bomber tires under 30,000-pound loads at 150 miles an hour. In service tests at carefully selected airfields, they pile up performance data under actual flight conditions. And from the war theatres of the world, the experience of combat fliers channels back through Wright Field to the nation's builders and designers of airplane tires.

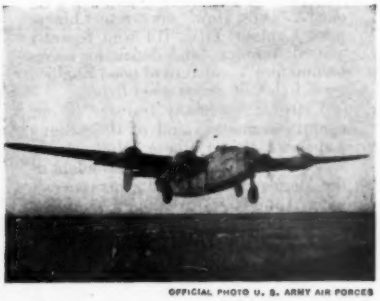
Planning, testing, searching far into the future, the Materiel Command, working with industry, is keeping our Army Air Forces out in front of the enemy in fighting power... by finding the answers to tomorrow's questions today. For this invaluable service, "U.S." says, "Thank you, Materiel Command."

SERVING THROUGH SCIENCE TO SPEED THE VICTORY

OFFICIAL PHOTO U. S. ARMY AIR FORCES

LABORATORY TESTS... In the Materials Lab all the parts of a tire are tested, the findings tabulated, compiled and reported to the tire makers. C. J. Cleary, Asst. Chief, Materials Labsays, "Give us a material that has no weight and no mass and having infinite strength — and we will have reached our ultimate goal."

SERVICE TESTS... Under the supervision of Captain L. V. Coursen of the Materials Lab, shown at the landing test wheel, service tests on airplane tires of all types are constantly being conducted. With the data from these tests, "U.S." and other airplane tire makers are kept up-to-date on product performance.



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COMBAT TESTS... Although "U.S." maintains one of the largest scientific staffs in the rubber industry, there are many things that only Wright Field can find out about airplane tires. Reports from combat areas help keep our Army bombers and fighters equipped with stronger, lighter, safer tires.

UNITED STATES RUBBER COMPANY

1230 SIXTH AVENUE, ROCKEFELLER CENTER, NEW YORK 20, N. Y.

WINGTIPS
by Abel Grasshopper

AVIATION NEWS AND GOSSIP

Due to the washing out of the War Training Service Program by the Civil Aeronautics Board, some hundreds of primary trainers of the personal plane variety will probably be available for private ownership. Like the good Marines "They've done their duty, and they're ready to do it again." Having established a fine performance record while in Air Corps use they can still give many hours of dependable flying. Until the day when you can get that post-war Aeronca, these jobs will help to "Keep you flying."

☆ ☆ ☆ ☆

Take a twelve ton hammer...break a trip arm...and bang! goes a vital pro-

duction schedule. Stir in some hectic phone calls to six different states...then start sweating at the promise of two weeks delivery. Add one resourceful pilot and Abel Grasshopper (an L-3 to you) . . . results . . . just two days and nights...and back to work goes the big press...Another defeat for the Axis.

Such situations become incidents here at the home of "First and Finest."

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"Ding How" say the clever Chinese when they wish to pay top tribute to man or deed..."Ding How" say we to Chinese pilot Captain Yuan Ho who recently visited Aeronca "and departing leaves behind him"...an aura of good English, good fellowship, and good flying.

There are so many trainees in our country from the land of the Chiang Kai-sheks, that Chinese pilots are no longer a novelty, but this descendant of the Mandarins is indeed a man among men. "Ding How" to Captain Yuan Ho, our nominee for Pilot of the Month.

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Don't relax . . . . resourceful America is winning the War . . . . United America can win the Peace

Only light aircraft company to receive Army and Navy "E"
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FIRST Grasshopper FINEST
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Letters

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Sirs:

In the April, 1944, number of FLYING you published an article: "The French Air Force Never Fought." I feel it is my duty to protest against the implications of this article.

Whatever opinions may be about what French aviation could have or should have been, the fact remains that French flyers fought during 1939 and 1940 with an heroic effort. This statement can be supported by figures showing the number of personnel, the losses sustained and the losses inflicted upon the enemy.

For instance, a few hundreds of French fighter planes shot down 919 enemy planes—and the French losses in killed amounted to about a third of the pilots engaged in combat.

Because of these figures, no Frenchman and especially no French aviator can read or hear a phrase such as the one that is used as a title to the article without protesting. Such a title is not only a violation of the truth but also an insult to those who performed their duty valiently and who gave their lives for their country.

For that reason, while I protest against the article, I cannot believe, however, that the title, "The French Air Force Never Fought", expresses the real intention of its author.

BRIG. GEN. CHARLES LUGUET
Chief of the French Air Force in the United States
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● In his newly-published book, "The Triumph of Treason", Pierre Cot, author of the article "The French Air Force Never Fought", grants all honors to the men of the French Air Force, insists that the mistakes of the generals prevented the air force from being used effectively. On page 54 he says: "Sixty per cent of the airplanes were never used in the war." On page 288 he says: "With more than 6,500 aircraft on May 1, 1940 . . . the French Air Force lost in the service of France 757 aircraft of which a small percentage was destroyed in combat"! and again on the same page: "It would hardly be an exaggeration to say that French air power was not beaten; it never fought." On page 302 he charges that the French general staff "wilfully refused to construct an attacking air force." For these reasons, FLYING feels that the title did express the real sentiments of the author.—ED.

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With all due respect to Brig. Gen. Henry J. Reilly, after reading his article, "The Misuse of Air Power", it is probably all for the best that General Reilly is now on the retired list.

General Reilly does not believe in strategic air power as advocated by Douhet, and whose disciples are now commanding the RAF and AAF. He also disagrees with our present ground officers and condemns General Marshall's recent Army regulation which states: "First priority of missions of the tactical air force is to gain the necessary degree of air superiority." General Reilly, therefore, occupies a rather unique position: he opposes the air strategy of both the the air and ground officers of the United States Army.

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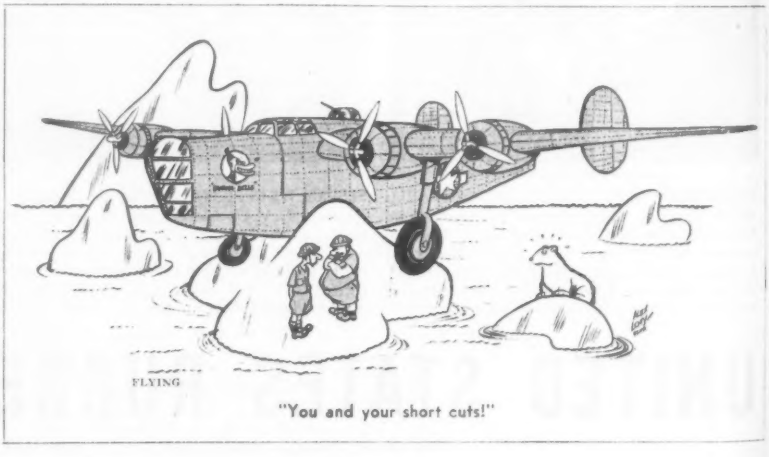

"You and your short cuts!"

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Red Seal
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POWER TO WIN

ARMY E NAVY

Awarded to the Detroit and Muskegon Plants of Continental Motors for High Achievement

The skill, initiative, fearlessness and fighting qualities of our air force are beyond description and America owes them lasting gratitude.

Many of these air-men learned to fly in trainers powered by Continental Red Seal Engines.

We are proud that they could, during their training, depend on the steady surge of Red Seal Power as we, today, can depend on their world-famous fighting ability.

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Aircraft Engine Division
MUSKEGON, MICHIGAN

Your dollars are power, too, — Buy War Bonds and Keep Them

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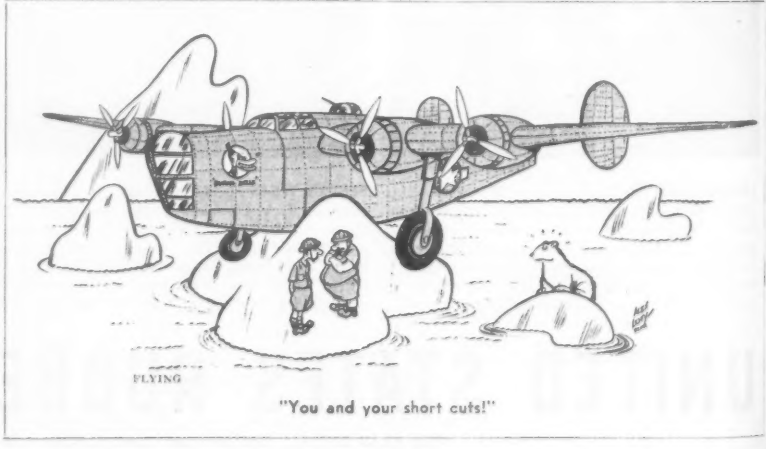

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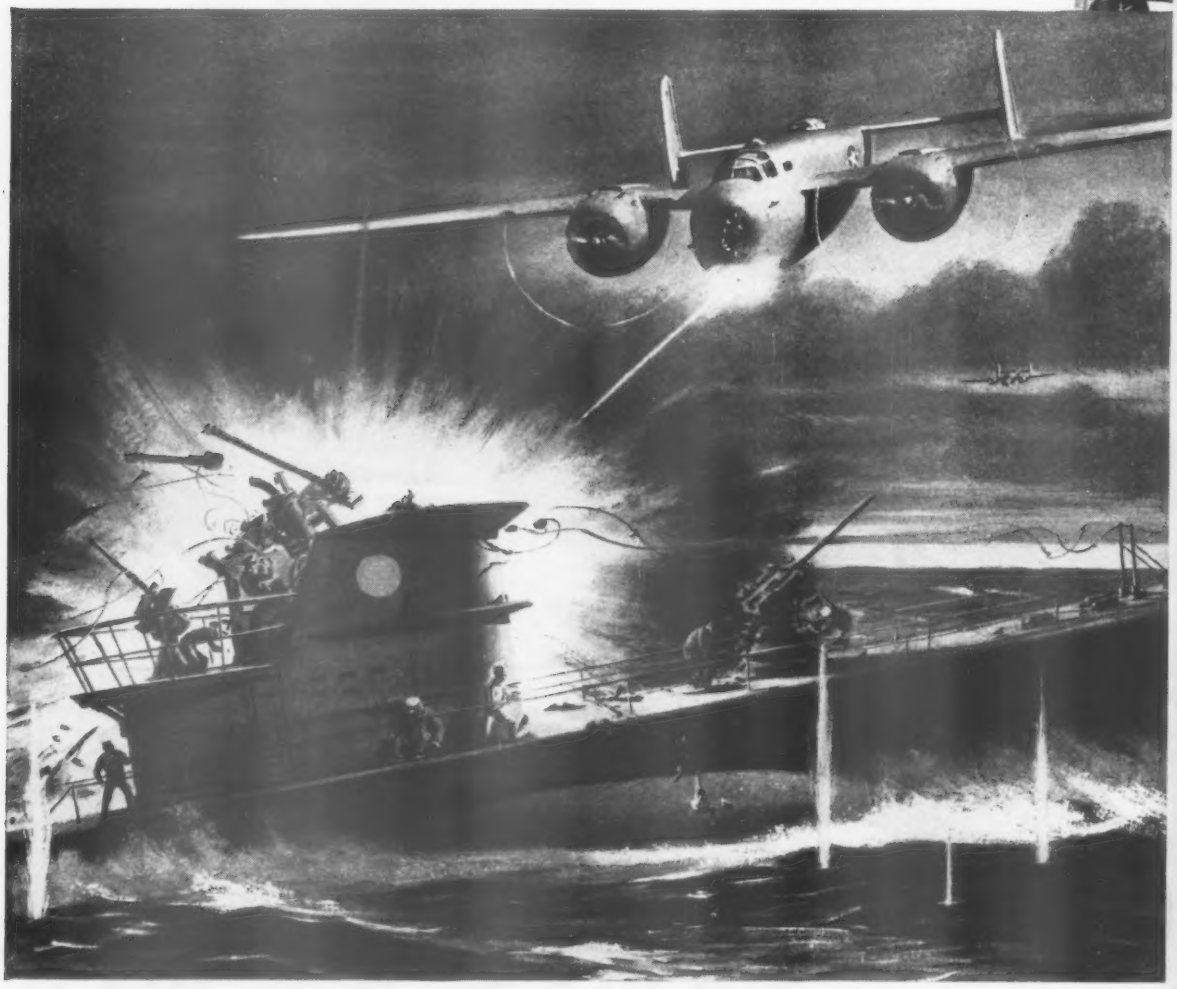
Continental Motors Corporation
Aircraft Engine Division
MUSKEGON, MICHIGAN

Your dollars are power, too, — Buy War Bonds and Keep Them

"CANNON-PACKIN' BOMBER"

North American "B-25" armed with 75 mm. cannon



As the first light of dawn paints the South Pacific skies, a Jap submarine rides the surface... recharging its batteries... lurking in wait for its prey. Suddenly, two tiny specks appear on the horizon... grow quickly larger ... take the shape of American B-25's. "Crash-dive!" screams the Japanese commander. Too late, though. These are "Flying 75's"—bombers that pack the Fire-Power of 75 mm. cannon, and start throwing high-explosive from thousands of yards away. Now the nose of the first plane blossoms orange flame. It's a near miss... then a glancing hit... then a direct smash on the conning tower. And another Jap submarine will never prowl again!...

IT HAS LONG been a dream of flying men to carry cannon of fieldpiece caliber into aerial combat. Today, thanks to the men of Army Ordnance, and the Air Forces, and American industry, too—that dream has become a reality. 75 mm. cannon are now *flown* into battle by U. S. bombers—the same size cannon that we at Oldsmobile have long been building for tanks. Other Oldsmobile Fire-Power products include aerial cannon of the fast-firing, automatic type; high velocity cannon for tank destroyers; shell of many types, including those used by the "cannon-packin'" B-25's.

FIRE-POWER IS OUR BUSINESS!

HELP KEEP THE
"Flying 75's" Firing!

If you can't *fire* these big, high-explosive shell, you can help *buy* them. Put your dollars in War Bonds and own a share in these weapons. All money will be cheerfully refunded, with interest, after Victory!

OLDSMOBILE DIVISION OF GENERAL MOTORS

KEEP 'EM FIRING

"We at Colonial Value a Pound Saved on a Plane at $400.00"

SAYS SIGMUND JANAS,
PRESIDENT, COLONIAL AIRLINES, INC.

"AIRPLANE manufacturers are keeping a constant look-out for practical means of reducing the empty weight of aircraft. One example of this is the uncamouflaged Boeing Flying Fortresses, now being delivered without war paint in accordance with the War Department's recent directive. This change lightens each big bomber by some 60 pounds, adds several miles per-hour speed. All this cannot be measured in terms of money. But on commercial planes, weight saved and increased revenue are synonymous. Here at Colonial Airlines, we estimate that every pound saved is worth $400.00 throughout the first five years of the life of a plane."

SEND FOR BOOTS WEIGHT-SAVING BOOKLET TODAY

Comparative weights of various types of self-locking nuts comprehensively reviewed for the convenience of aircraft designers, engineers, operating and maintenance personnel. Copy will be sent you, free, upon request.

BOOTS NUTS SAVE UP TO 60 LBS. PER PLANE

- Much lighter but tougher than other nuts.
- In wartime specified for all types of military aircraft.
- In peacetime will be standard fastenings on commercial planes.
- Can be used over and over without the accelerated locking loss of other nuts.
- "Outlast the plane."
- Approved by all government aviation agencies.

WING-STYLE NUTS —IN CHANNEL

This is one type of the famous Boots All-Metal Self-Locking Nuts—set in straight or curved channel for speed in assembly.

BOOTS SELF-LOCKING NUTS

"They Fly With Their Boots On—Lighter"

Boots Aircraft Nut Corporation, General Offices, New Canaan, Conn., Dept. N

LEKTR°LITE is among the most desired of all lighters with our fighting men because it's the lighter that needs no pampering or tampering. LEKTR°LITE is FLAMELESS, no flame to blow out, no spark to fail. We are turning out more LEKTR°LITES than ever in our history to meet the demand from the boys overseas.*

*Reprints of letters we have received from service men overseas are available on request

There is plenty of LEKTR°LITE FLUID for those owning pre-war LEKTR°LITES. So fuel up — the more you use it, the better it works!

IT'S THE FIGHTER'S LIGHTER TODAY...YOURS TOMORROW

LEKTR°LITE
Flameless Lighters

LEKTR°LITE CORP., 1907 PARK AVENUE, NEW YORK 35, N. Y.

(*Continued from page* 82)

ground forces (Army regulations give this third priority).

If such were the case, one asks: how would it be possible for the air force to render aid to the ground forces, until first, they had established air superiority and thereby gained the essential condition which allows the air force to stay in the air?

Space does not permit a detailed reply . . . but Air Chief Marshal Sir Arthur Tedder said: ". . . Air fighting has changed warfare and made it three-dimensional. It has never been seen before and cannot be described in the terms of the old warfare, such as 'long-range artillery.' The command of the air determines what happens on land and on sea. Air supremacy will win the war. The essential lesson learned in the Middle East is that an air force is a separate offensive entity striking at the enemy in co-operation with the army. . . .

"The cobwebs have not been shaken away from the old ideas of air support—they have been blown away and shattered by the guns and bombs of the air striking force."

It appears, however, that Air Chief Marshal Tedder is wrong in one respect: not all of the "cobwebs" have been blown away and shattered; General Reilly is still with us!

H. Calvin Cook

Steubenville, Ohio.

ARM THEM WITH RIFLES

Sirs:

After reading "The Misuse of Air Power" by Brig. Gen. Henry Reilly (who is he?) the answer seems very clear to me.

The Scott theory, built along the lines of the article:

Since *Fortresses, Liberators* and *Superfortresses* will not be very useful for attack bombing just scrap them, give the crews rifles and make them infantry. Thus we would not lack "sufficient ground troops."

Simple, isn't it?

Myron Scott

Smith Center, Kans.

PRO-REILLY

Sirs:

Hail to General Reilly!

No one needs a better example to show the general is right than your April article on "Invasion Air Pattern" by Major DeWeerd.

How could anyone who read the Reilly article support DeWeerd? The major's technique was interesting. Like a row of puppets, he sets up a series of arguments which he effectively demolishes. The only trouble is that DeWeerd's puppets have nothing to do with Reilly's arguments.

DeWeerd objects to an "umbrella of planes." Reilly never asked for such an umbrella.

DeWeerd supports strategic bombing. Reilly never condemned it, but only asked that all planes be devoted to strategic support in times of attack. Because of the flexibility of the air, he feels that planes can be used for both strategy and tactical support.

DeWeerd says we must win the air battle first, but such things are merely relative. Does anyone imagine that even when our planes can raid the Reich with impunity the Germans won't have saved out aircraft to attack our invading armies?

If we can win the war by strategic bombing how does it happen that according to our own admission the Germans have more planes today than they had a year ago? Just a question, but what's the answer?

Jere Kingston

Milwaukee, Wis.

WE RATE ZERO

Sirs:

You published an article in your December, 1943, Flying titled "Flight Testing the Zero."

You mentioned the Zero having two .30-caliber bullet holes in the fuselage and engine cowling. You seemed to know not why they were there and from what cause. Really, don't you know, my friend?

I was present when the holes were put in the damn plane and also when the plane was brought in from the marsh. In fact, I even helped bury the pilot. Tell me, now, why all the secrecy; that was over 19 months ago?

Franklin Earl Todd, Jr.
Amm 2/c, U. S. Navy.
Naval Air Station

Astoria, Ore.

● Flying cannot read minds, can only report what qualified officials tell its representatives, can only publish what they approve. If Sailor Todd knows the answer to his riddles why keep us in suspense?—Ed.

DRAFT BOARD

Sirs:

. . . I am no longer an aviation ground school instructor since my friends and neighbors were either too narrow-minded or ignorant to appreciate what my job in instructing aviation cadets meant to our national safety and to speed victory.

I am now an administration clerk (typist) for the Army Air Forces and feel as if I have been forced to shirk my real duty because of an unwise draft board. Perhaps your magazine could enlighten my board and others through your brilliant articles and save other instructors from leaving positions so definitely essential to our war effort . . .

Pfc George Friedland
501st Training Group
ORTC

Kearns, Utah

CREDIT NAVY

Sirs:

Your article, "Instrument Flying Modernized," included in the February issue, implies that the AAF is taking credit for modernizing instrument attitude flying.

Some two years ago here at Pensacola in our instrument squadron it was realized that the old "1-2-3 System" was outmoded. Our training officers at that time began to develop "Full Panel Attitude Flying." A short time later our squadron

(*Continued on page* 153)

Kingfishers Catch a Big One!

CHALK off another Jap sub . . . a whopping big one!

First call to action came from an alert Australian gunboat, escorting a large troop transport convoy, outward-bound in the Pacific. In swift response to the electrifying flash—"submarine contact," a Navy Kingfisher alighted alongside the gunboat for detailed verification. Ocean landings and take-offs are but part of the day's work of Edo-float equipped Kingfishers—Observation Scout Seaplanes of the U. S. Fleet.

Information double-checked . . . Kingfisher Pilot Lt. (j.g.) Robert J. Clinton guns his ship, takes off straight for his unseen objective. Seconds grow to minutes. Minutes to five . . . to ten . . . while the safety of precious lives, ships and urgently needed cargo hangs in the balance.

In a scant 15 minutes after his take-off, Lt. Clinton sights his sub—only a tell-tale periscope cutting the waves. The Kingfisher dives to the attack.

Depth charge one . . . depth charge two explode dead ahead of the periscope. Marksmanship is excellent. Down goes the Jap submarine. A trail of air bubbles and oil mark its path.

But submarines die hard. This one bobs up five minutes later, bow first, at a steep angle. The only Jap that isn't treacherous, dangerous, is a dead Jap. And that goes for submarines, too. Pilot Clinton dives in to strafe. His machine gun sprays the deck of the sub—a large one. His only hope is to keep the crew from manning the heavy deck gun . . . a Kingfisher being the smallest Navy plane for combat duty.

Success seems almost at hand—but Clinton's machine gun jams! He zooms in a flash. The Japs reach their gun stations. AA fire breaks loose in a Hell of death. But Clinton and his Kingfisher hover high above. Keeping an eye on his wounded prey, Clinton calls for assistance.

Four more seaplanes, all Edo-equipped, come in for the kill. The surfaced submarine, circling wildly, is out of control. But her large forward gun and anti-aircraft guns blaze deadly fire.

Not a breeze stirs. The undersea raider lies shrouded in her own smoke. Behind this cover, Pilot Lt. (j.g.) Robert L. Gittings maneuvers unseen into position astern to launch the second attack. Two charges drop swiftly to the mark. Neither explodes. Their fuses had failed.

But there is no reprieve for a Jap sub with Navy Kingfishers overhead. Lt. (j.g.) Knute W. D. Lee, USNR, dives his plane. His first charge explodes 30 feet aft of the conning tower. Jap gunfire increases in intensity. Lee turns and dives again. His second charge hits home, within 10 feet of the starboard beam.

The blast sends a spout of water geysering 50 feet upward. And—in less than 60 seconds—the giant sub disappears for good.

Landing handily on the ocean, the Kingfishers pick up six survivors of the submarine's crew. No doubt about the importance of the sub. It was one of Japan's largest undersea craft. Bad news for Tokio. But one more example of how Edo-equipped Navy Seaplanes are contributing materially to our mounting record of victories in this global war.

EDO FLOAT GEAR

SERVES THE UNITED NATIONS

ARMY E NAVY

EDO AIRCRAFT CORPORATION, 414 SECOND STREET, COLLEGE POINT, L. I., N. Y.

Flight Clearance, Army Style

(*Continued from page 61*)

weather, on his way out of the Carolinas into the east coast's vital defense zone just two states and 600 miles distant, still won't be able to get off the ground until he has obtained an Airway Traffic Control clearance, approvals to fly through the Charleston, S. C., and Wilmington, N. C., bomber command areas, and a special authority to leave the airways to land at his destination.

So tight are some of these restrictions that in certain areas pilots off on cross-country flights must telephone their home station, identify themselves by code symbol and obtain permission to re-enter their area.

But let's review a typical instance at an Army Air Force base as Lieut. Roger Wilco, a transient pilot, taxies his plane in. Almost before the prop stops turning a line of crewmen is on hand to pick up the pilot's arrival report. This is turned in at Base Operations immediately.

Then the pilot heads for Base Operations where he prepares to continue his flight.

Very probably he makes first for the weather office, where observers and forecasters are busy recording observation figures and plotting their colorful weather maps.

A quick but comprehensive check of the maps and teletype sequences, some words with the forecaster, and Pilot Wilco returns to Operations to put his flight plan on paper.

Unless he's an exception, he'll leave out some of the necessary entries on the blank form and will have to be reminded by the dispatcher. He may even omit entirely the information as to whether he plans to fly airways or direct.

Ultimately settled by reference to the maps are the involved discussions between pilot and dispatcher that ensue over such matters as a pilot's statement that he plans to fly airways between two points which may be entirely off the airways.

Behind his counter and surrounded by forms, maps, strident loud-speakers and jangling telephones, the dispatcher (although he is often an enlisted man) has a serious responsibility.

His signature at the bottom of a clearance indicates he is acting as a representative of the base commander. If he closes his eyes to dangerous weather, to proposed violations of flight rules, or to overloadings, or if he allows a pilot to brush aside the regulations, he is gambling with the lives of other persons and thousands of dollars worth of equipment.

Enlisted men may be designated as aircraft dispatchers only on written authorization; because of the great importance and responsibility attached to the duty they are appointed only after careful consideration of their qualifications.

When the clearance sheet (known as AAF Form 23) is completed to the satisfaction of the pilot and the dispatcher, there is enough data to answer almost any question which might arise concerning this pilot, his plane and his plan of flight.

As the pilot completes his portion of Form 23 he turns it over to the weather forecaster, who enters the route and terminal forecasts, forecast for the alternate airport if necessary, and indicates whether a vertical cross-section of the weather will be needed by the pilot.

Duly signed by the weatherman, the clearance form goes back to the Operations counter for a final inspection, and is submitted to Airway Traffic Control center to be fitted into the center's general traffic picture. Defense agencies involved along the proposed route also will be contacted for clearance at this time.

While these approvals are being requested by the Operations clerk let's turn back to Lieutenant Wilco, conferring once again with the dispatcher.

Hopeful hitch-hikers, their names and ultimate destinations registered at Operations, eye the pilot speculatively as the dispatcher ascertains if he will take on any passengers.

Any he puts aboard the departing airplane must be signed out on a "permission" list maintained under Army Regulations which make it possible for these air-minded military hitch-hikers to board a transient plane.

Should a departing pilot plan a landing at a civilian field, he may be given a special arrival and departure form which is to be mailed back to the base when he lands. This field must be looked up, too, for compliance with defense regulations which require that it be a "designated" landing area.

Until weather information restrictions were lifted recently, a confidential weather code would be given to Pilot Wilco at this point in his clearance procedure, and his signature given as a receipt. These codes, so leak-proof they could mean nothing to anyone without the key, have been temporarily shelved.

If a pilot has a large plane his Form 23 may not have enough space to accommodate all the names of personnel aboard. Their full names, ranks, serial numbers, organizations and home stations will have to be listed on still another sheet and affixed to Operations' copy of his Form 23.

Or if the pilot and the base are both under the Troop Carrier Command, the pilot will have to accomplish yet another detailed flight plan, similar to those used by the commercial airlines, in addition to his Form 23.

This shows, among other things, compass headings from one point to another, breakdown of loading, point-to-point weather, and altitudes between check-points.

A Troop Carrier pilot clearing from Pope Field, N. C., to Indianapolis specifies Greensboro, Pulaski, Blackstone, Huntington and Cincinnati as check-points. Carefully prepared directives tell him where and at which headings these ranges are projected to his course.

With a copy of this clearance in his possession the pilot, as well as the dispatcher, knows where the plane should be at every moment of the flight. Additional entries, made by the pilot en route, will serve as a check on the estimates he made before check-off.

Whether he's Troop Carrier or not, Lieutenant Wilco is not yet ready to leave Operations. He consults with the Operations man over danger area maps which review for him the localities to avoid while in flight.

His attention is also directed to the current "Weekly Notice To Airmen" and any teletype or other special Notams

(*Continued on page 92*)

I TROOP CARRIER COMMAND

FLIGHT PLAN

PILOT Ernest J. Brownlight OPNS. OFFR. Frank M. Spruce Maj. FROM Pope Field SHIP NO. 42-56819

CO-PILOTS Wm. L. Smith 2nd Lt. WEATHER OFFR. Harold Green 1st Lt. TO Stout Field DATE 9/5/43

FROM	TO	MILES	M. C.	TEMP.° F	ALT.	WIND DIR. AND VEL.	ESTIMATED GROUND SPEED	ESTIMATED TIME PT. TO PT.	ESTIMATED TIME OVER	ACTUAL TIME OVER	ACTUAL TIME PT. TO PT.	ACTUAL GROUND SPEED
DOP	GW	82	325	36°	4500	240-26	150	:32				
GW	US	83	328	32°	6000	360-20	150	:33				
US	KT	137	312	30°	8500	360-20	150	:55				
KT	HI	110	300	28°	4000	20-28	150	:44				
HI	CC	14	290.	28°	4000	40-26	150	:06				
CC	ID	101	290	27°	4000	50-21	150	:40				

REFUELING POINTS	FROM	TO	FROM	TO	FROM	TO	FROM	TO
	DOP	WST						
REQUIRED FUEL POINT TO POINT	350							
DEST. TO ALT. ARPT	100							
INSTRUMENT APPROACH & ATC	30							
TOTAL FUEL REQUIRED *	580							
ALTERNATE AIRPORT	LV							

WEIGHT EMPTY SHIP	17,459	PLANE WEIGHTS	
CREW WEIGHT AT 200 POUNDS	600	C-39	
GAS WEIGHT #8 GAL.	3120	C-47	
FREIGHT WEIGHT	400	C-46E	
PASSENGER WEIGHT AT 200 LBS.	800	C-53	
TOTAL WEIGHT	22,379		

* 100 GALLONS EXTRA

Typical Troop Carrier Command flight plan from Pope Field, N. C., to Indianapolis.

What good is a $10.00 raise ...if it then costs you $12.00 more to live?

SURE WE ALL want a raise . . . but raises today are bad medicine. Bad medicine for you. Bad medicine for everybody else. And here's why . . .

Suppose you do get a raise . . . and a lot of others get one, too. What happens? The cost of manufacturing goes up. Naturally your boss has to add this increase in cost to the price he asks the retailer. And the retailer, in turn, raises his price to the consumer . . . that's YOU.

Multiply these hundreds of items that everybody has to *pay more for* by the thousands of other workers who want raises . . . and by the thousands of business men and farmers who want more money for their products . . . result . . . you and all the others need another raise to make ends meet.

And so it goes . . . wages and prices chase each other up and up . . . until prices get so high that your dollar isn't worth a dollar any more.

So what good is a raise if your living costs go up even faster? And there's so little you can buy today anyway . . . with most factories in war production.

Of course it's hard to give up the luxuries of life . . . and even harder to give up some of the necessities. But this is War! And when you think of the sacrifices our fighting men are making . . . many of them giving up their lives for us . . . no sacrifice we can make should be too great.

So if you want to be able to enjoy the good things of life in the peaceful days to come . . . if you want to speed victory and thus save the lives of thousands of fighting men . . . start doing these seven things now . . .

1. Buy only what you *need*. Take care of what you have. Avoid waste.

2. Don't try to profit from the war. Don't ask more than you absolutely *must* for what you have to sell . . . whether it's *goods* or your own *labor* you're selling.

3. Pay no more than ceiling prices. Buy rationed goods only by exchanging stamps. Otherwise, you're helping the black-market criminals, hurting yourself and all other good Americans.

4. Pay taxes willingly. They're the cheapest way of paying for the war.

5. Pay off your old debts—all of them. Don't make new ones.

6. If you haven't a savings account, start one. If you have an account, put money in it—regularly. Put money in life insurance, too.

7. Buy and hold War Bonds. Don't stop at 10%. Remember—Hitler stops at nothing!

Use it up . . . Wear it out. Make it do...Or do without.

HELP US KEEP PRICES DOWN

A United States War message prepared by the War Advertising Council; approved by the Office of War Information; and contributed by the Magazine Publishers of America

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TYPE 508 TRANSMITTER

(Illustrated at right). Type 508 Transmitter as designed by AAC for Army Airways Communications Service. Power output 450 watts each channel. Types of emission A1, A2, A3 and FM teletype. Five channels can be operated simultaneously. Single or dual modulator can be supplied.

E-34

AAC Products

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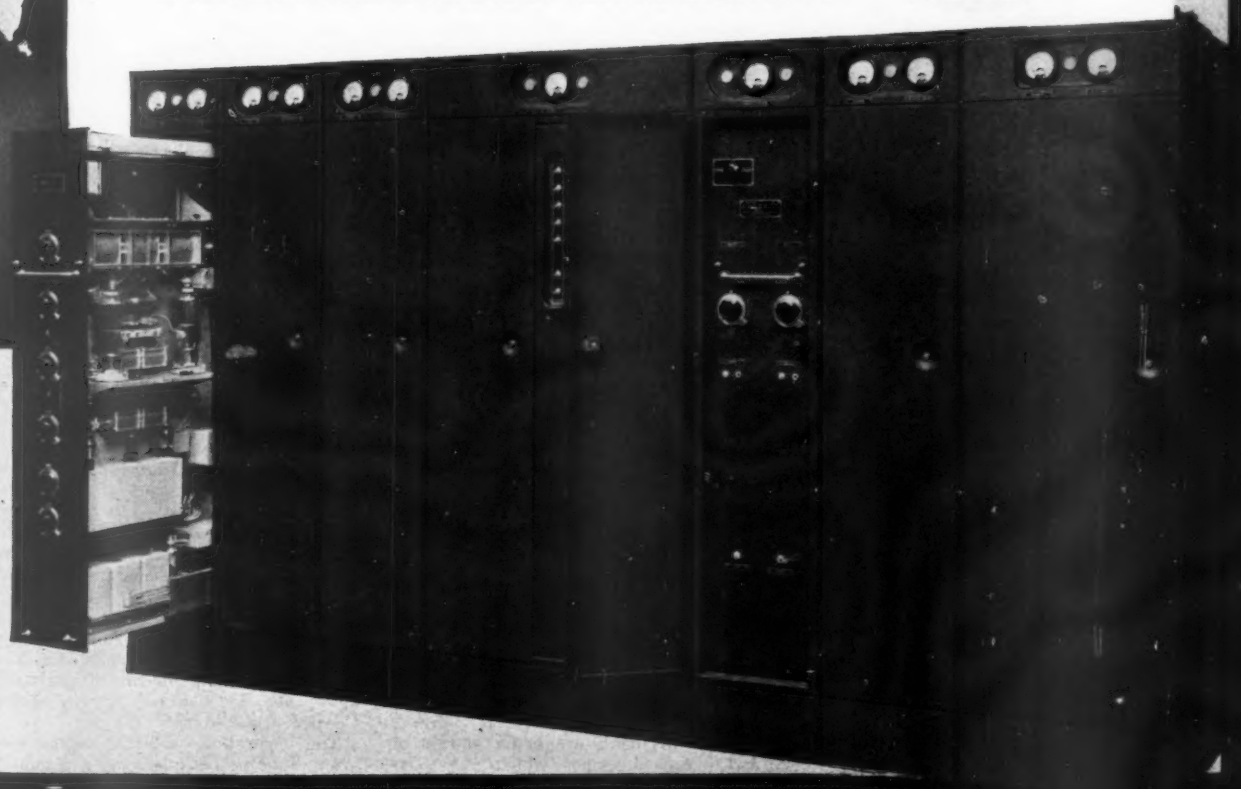
THE Air Transport Command has become the greatest air transportation system in the world . . . delivering planes, materials and personnel to the Allied forces everywhere!

As ATC pilots fly the seven seas and girdle the earth they are served by communications systems of which Aircraft Accessories Transmitters are an important part. These "508 units" are an outstanding example of the engineering skill and production tempo of Aircraft Accessories. Designed specifically to performance requirements of Army Airways Communications Service (AACS), which sets up and operates radio facilities for the ATC, this equipment is now in operation at many of the widespread world outposts maintained by AACS.

This type of AAC equipment can be readily adapted to immediate use by other airlines. Deliveries can be made in remarkably short time, if adequate priority ratings are available.

ELECTRONICS DIVISION KANSAS CITY, KANSAS



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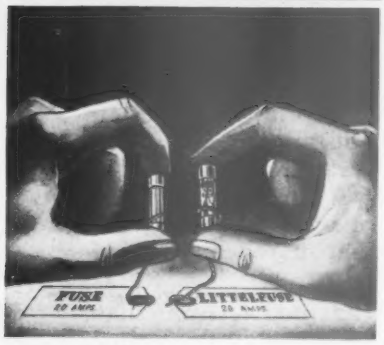
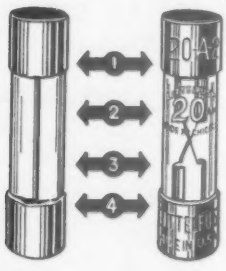


ORDINARY FUSE **LITTELFUSE**



1 Cap cemented on. Easily loosened.	**1** LOCKED CAP ASSEMBLY (Pat.). *No cement.*
2 No reinforcement of fuse element.	**2** Elements twisted at 90° against severe vibration.
3 *Mechanically polarized.* Responds to vibration.	**3** *Mechanically depolarized* against vibration.
4 Unprotected against contraction and expansion.	**4** "Gooseneck" takes up contraction and expansion.

ENGINEERED FOR TODAY'S NEW CIRCUIT PROTECTION!

"Quicker than a short circuit."

Extraordinary circuit protection is now imperative in ever-widening fields of electrical products. Littelfuse engineering meets and anticipates these demands.

Every Littelfuse is thoroughly pretested before delivery.

If your problem is circuit protection Littelfuse can help you.

LITTELFUSE Inc.

263 Ong St., El Monte, California
4793 Ravenswood Ave., Chicago 40, Ill.

(*Continued from page* 88)

covering fields he will pass en route.

By now, if all the approvals except Airway Traffic Control are in, his Form 23 is signed by the dispatcher and Lieutenant Wilco is cleared from Operations to his plane, where the line crewman has been checking fuel supply and giving the plane a quick, thorough inspection.

With the plane's prop turning over, the pilot stands by until the control tower advises him of the terms of his Airway Traffic Control clearance, after which he is clear to go.

The entire clearance procedure, in a smoothly-run Operations office, has taken as long as 25 minutes, probably no less than 10.

But Operations' job does not end when the plane folds its wheels and drones off out of sight. A jingling of the control tower phone announces the official time of take-off; a clerk sits down to type essential information from the Form 23 for posting on the traffic blackboard. He spikes the pilot's original arrival report with the Form 23.

If the pilot's estimated time of arrival draws near, passes and a report of his safe arrival at the other end of the flight is not soon forthcoming, clerks and dispatcher begin to "sweat him out," as the Army puts it.

The dispatcher re-checks the Form 23 for possible error or miscalculation, and refers to a mile-speed computer and distance charts. He confers with the weatherman to learn if unforeseen weather changes have occurred since the pilot's departure.

A clerk begins frequent contact with Airways Traffic Control to learn when and where a position report was last received from the plane. A hurry call is put out for the mechanic who serviced the airplane and he is questioned as to whether there were any minor repairs required at the time of servicing.

Degree of uneasiness in Operations varies according to the latest weather reports and known facilities at the station of destination for filing arrival reports.

If a plane should crash en route, Operations at both ends of the route have definite, hurry-up jobs to perform and the personnel in these offices will turn their combined efforts toward getting messages on their way to all concerned, dispatching search and salvage parties, and beginning investigation of the accident.

Greatly aiding pilot and Operations personnel is the Pilot's Advisory Service of the Air Forces, representatives of which work with the Airways Traffic controllers, watching weather trends along flight routes of military aircraft whose movements are being plotted by ATC. Any messages which may have bearing on the safety of the plane are relayed to the pilot by the Advisory Service.

Quick action by the Advisory Service plus a pilot's alert listening watch during flight recently enabled that pilot to land safely in the face of an east-coast hurricane wind which had been unforeseen at the time of his take-off.

The pilot, cleared from Washington, D. C., to Camp Davis, N. C., was considerably less than an hour away from his destination when a relayed warning from Camp Davis Operations, which has no direct ATC communication, reported a 75 m.p.h. wind coming his way. The message was passed on to ATC by a nearby station, and the pilot was able to change course and land well away from the storm area.

Also represented in the control centers, and watching like a hawk for violations of flight regulations, the Office of Flying Safety pounces promptly on any violation which perhaps had a happy ending but shouldn't have—and the offending pilot's commanding officer very shortly receives a letter directing an explanation. If the Operations Officer whose office cleared the offender made a mistake, he too will receive a letter.

Serving the individual pilot and getting him safely and lawfully on his way is still only a part of Operations' function. In handling traffic, the theme is usually the same with variations on helping the pilot find a suitable alternate field, searching through airport directories for data on distant stations, or plotting and drawing a map course.

To meet any emergency which may arise locally, constant liaison is maintained between Operations and the engineering-alert crew, control tower, radio and weather stations.

Operations dispatchers must be masters of, and have at tongue-tip, all the CAA's Part 60, reams of Army and Air Force regulations on military flying, and a number of defense regulations which have been laid down since the war.

Sandwiched into the corners of an Air Force Operations man's mind, behind the traffic rules and regulations, must be a store of other knowledge.

He must be prepared to quote distances from one field to another, frequencies of range stations and control towers, length of runways at Podunk Field, tell on which sectional chart a certain field is to be found, or to tell the time of the day's official sunset.

The Army dispatcher must have a working knowledge of weight loadings, speed, range and fuel capacity of all types of military aircraft, ability to read airways maps and weather sequences and maps. Somewhere handy to his counter will be shelves swelling with publications and reference files, to which he may refer many times daily.

The clerks, working toward the time when, by virtue of experience and alertness, they are rated as dispatchers, have to be expert in flight control and traffic rules, and must know Airway Traffic Control procedures.

The Operations Officer, combination groundling and airman, and top man of the office, is generally a rated pilot with years of flying behind him. His is one of the most important jobs on the base as all flying activity there is in his hands.

When the weather is down and the pilots are relaxing in their bunks, the Operations machinery keeps right on rolling. With no traffic, and the phones

"Shower Bath" for the Axis

...COURTESY OF BELL AIRCRAFT

In addition to building in our Niagara Frontier plants,* thousands of Airacobra fighter planes for the U. S. Army Air Forces and their Allies, Bell Aircraft today is also one of the nation's largest producers of gun mounts and other specialized ordnance materials.

Many of our nation's bomber and fighter planes—P. T. boats and other surface craft—our cargo ships—are helping to shoot the Axis out of the war with guns swinging on one of the various types of Bell-designed gun mounts manufactured in Bell's new ordnance plant at Burlington, Vermont.

Bell Aircraft's Ordnance Division was started in order to develop for one of Bell's own planes a flexible gun mount which prevented the gun from "bucking" when fired and made it as easy for the gunner to control as a garden hose.

So successful was this new type mount that, with the cooperation of Army and Navy officials, we began designing and building machine gun mounts incorporating this same principle for other types of aircraft as well as surface ships.

We are proud of the trust the United States government has placed in the *Creative Ability* of our designers, the *Skill* of our workers and the *Management* of the Bell Ordnance Division.

When peaceful days return, this same trinity of talent will not only continue in developing better ordnance equipment, but will also turn to pioneering other developments to make the era of post-war living so worth-while fighting for now. © Bell Aircraft Corporation.

*And soon from the new Bell Bomber plant in Georgia, will come more planes to help speed the day of Victory.

MEMBER AIRCRAFT WAR PRODUCTION COUNCIL—EAST COAST, INC.

BELL *AIRCRAFT*

Niagara Frontier Division, Buffalo and Niagara Falls, N. Y.
Ordnance Division, Burlington, Vt.
Georgia Division, Marietta, Ga.

PACEMAKER OF AVIATION PROGRESS

BUY WAR BONDS AND SPEED VICTORY

THAT OUR PILOTS MIGHT *Outfight* THE ENEMY

A Legion of Curtiss P-40 Aces* and Double Aces† Win United Nations' Highest Honors

UNITED STATES DECORATIONS, MEDALS, CITATIONS

DISTINGUISHED SERVICE MEDAL (OAK LEAF CLUSTERS)

DISTINGUISHED SERVICE CROSS (OAK LEAF CLUSTERS)

DISTINGUISHED FLYING CROSS (OAK LEAF CLUSTERS)

SILVER STAR (OAK LEAF CLUSTERS)

AIR MEDAL (OAK LEAF CLUSTERS)

LEGION OF MERIT

PRESIDENTIAL ORGANIZATION CITATION (OAK LEAF CLUSTER: SILVER OAK LEAF CLUSTER, BRONZE OAK LEAF CLUSTER)

DECORATIONS, MEDALS, CITATIONS OF OUR ALLIES

Britain . . . Distinguished Service Order (Bar), Distinguished Flying Cross (Bar), Distinguished Flying Medal.

France . . . Croix de Guerre (Palms and Star)

Russia . . . Order of Lenin, Order of Red Banner, Hero of Soviet Union, Order of Guards, Medal of Valor, Order of Red Star, Order of Georgian Republic.

China . . . . Starred Wing, Cloud Banner (5th Order), Cloud Banner (6th Order).

* **ACES:** Those pilots with bag of 5 to 9 enemy aircraft to their credit. † **DOUBLE ACES:** Those pilots with bag of 10 or more enemy aircraft to their credit.

CURTISS P-40 . . . *Cradle of Heroes Born in the Sky*

Enemy hordes stalked the global skies! Into the blue against them flew pilots of the United Nations, airborne on Curtiss P-40 wings. This is history!

From the earliest days of World War II, these teams of plucky pilots and their Curtiss P-40's have swept the air in every theatre of conflict. On occasion, "lone wolfing". Other times in squadrons! Their total formed a mighty armada whose blazing guns have written an unparalleled saga of successful aerial combat.

In the battle-raked heavens throughout the world, these pilots have won undying glory, symbolized by distinguished military decorations. Honor the pilots!

Salute the scrappy Curtiss P-40 fighters which carried them to success. Together, against overwhelming odds, they fought to finally wrest air supremacy for America and its Allies.

Another Contribution of

Curtiss-Wright Corporation

AIRPLANE DIVISION

Toward Winning This War

BUFFALO - COLUMBUS - ST. LOUIS - LOUISVILLE

MEMBER, AIRCRAFT WAR PRODUCTION COUNCIL, EAST COAST, INC.

and loud-speakers quieted, clerks and dispatchers turn-to on the paper work. Radio facility charts, instrument approach data and airport directories must be corrected from the Weekly Notice to Airmen; CAA and Air Force regulations are corrected or added to weekly.

These—plus preparation and maintenance of flying time reports for all pilots assigned or attached to the base, status board for base aircraft, weekly and monthly reports—all help keep Operations personnel from having more than two consecutive dull moments.

And if the air base is situated at or near a large military camp, Base Operations also becomes an Army-style passenger and ticket office, with prospective passengers asking, begging or demanding rides.

So, if you hear a military pilot grousing about delays in obtaining clearance from a base, hold a kindly thought for the dispatcher—he's got his hands full and he's really as anxious to speed the parting guest as the pilot is to be on his way. END

Airlines at War

(*Continued from page 27*)

inch clearance of bearing. But the planes still had to be serviced. Now American trains "specialists" who know bearings but not spark plugs, or spark plugs and not bearings. Men over draft age and women train for two months at the Academy of Aeronautics. The first month's training is basic and includes blueprint reading and similar fundamentals. In the second month students are divided according to shop needs and each group learns one limited, specialized job.

Get a pass to a maintenance shop now and you'll see clusters of these masters of only one trade—each with a function as definite as that of a bee in a hive—all working under the direction of some old-timer who once, lovingly and leisurely, plied his tools over an entire plane.

With similar deliberate planning, other airlines have adjusted their once comprehensive training methods to wartime needs. But one human factor in the maintenance speedup just happened. A shop foreman told me about it almost as if it were a shameful secret. "It's wonderful," he whispered, "how much quicker and better these new women crews clean the planes!"

In addition to line maintenance, all airlines completely overhaul their planes at regular intervals. Each plane that has flown 5,000 hours, each engine that has flown 750, gets a thorough teardown, going-over, and replacement of parts. The airlines haven't softened their adamant principle to prepare, not to repair; they haven't eliminated a single little step in overhaul; yet they have managed to keep fewer planes tied up in overhaul shops and each plane is there for shorter periods.

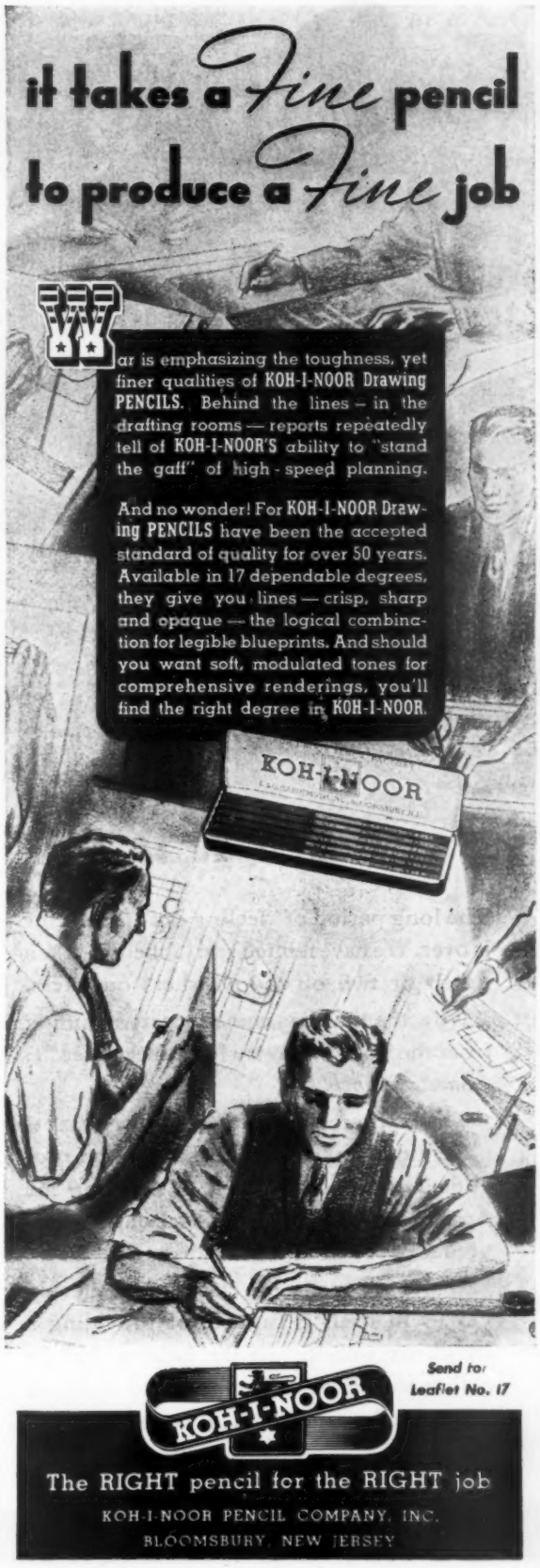
Certain minor plane work, formerly done in overhaul, is now included in line maintenance every two and a half months when the engine is removed and the plane is idle anyway. Three shifts, working 24 hours a day, have reduced the overhaul period in most shops from 30 days to 10. United Air Lines has boiled it down to two. By means of careful and complicated scheduling only one of an airline's planes is in overhaul at any time, as against the previous three. The other two can carry on in the air.

Overhaul shops have been moved from the centers of runs to near their ends. This allows the last hour of flying time before overhaul to be squeezed out. Formerly, if a plane on the New York-Chicago run had flown 745 hours, it was left in Chicago. Now a plane nearing overhaul is placed on a shorter run, say from New York to Boston.

Perhaps overhaul's most spectacular time-saver has been the drop from 144 man-hours for changing a tire to under two.

Remember the days when it was a major operation to change a tire on a car and whole families sat dismally at the roadside until the agonies were over? Airplane tire changing was in the corresponding stage until recently, but worse! Tire and rim for a heavy plane weigh about 600 pounds, and 110-m.p.h. landing speeds generate such heat that the rubber melts and sticks fast to the metal. Planes used to have to be jacked dangerously high to make room for wheel removal. Six-man teams, working three shifts of eight hours, wielded great sledge hammers that seemed to make the tires cling tighter the harder they struck.

(*Continued on page 98*)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to produce a Fine job
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And no wonder! For KOH-I-NOOR Drawing PENCILS have been the accepted standard of quality for over 50 years. Available in 17 dependable degrees, they give you lines — crisp, sharp and opaque — the logical combination for legible blueprints. And should you want soft, modulated tones for comprehensive renderings, you'll find the right degree in KOH-I-NOOR.
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Send for Leaflet No. 17
The RIGHT pencil for the RIGHT job
KOH-I-NOOR PENCIL COMPANY, INC.
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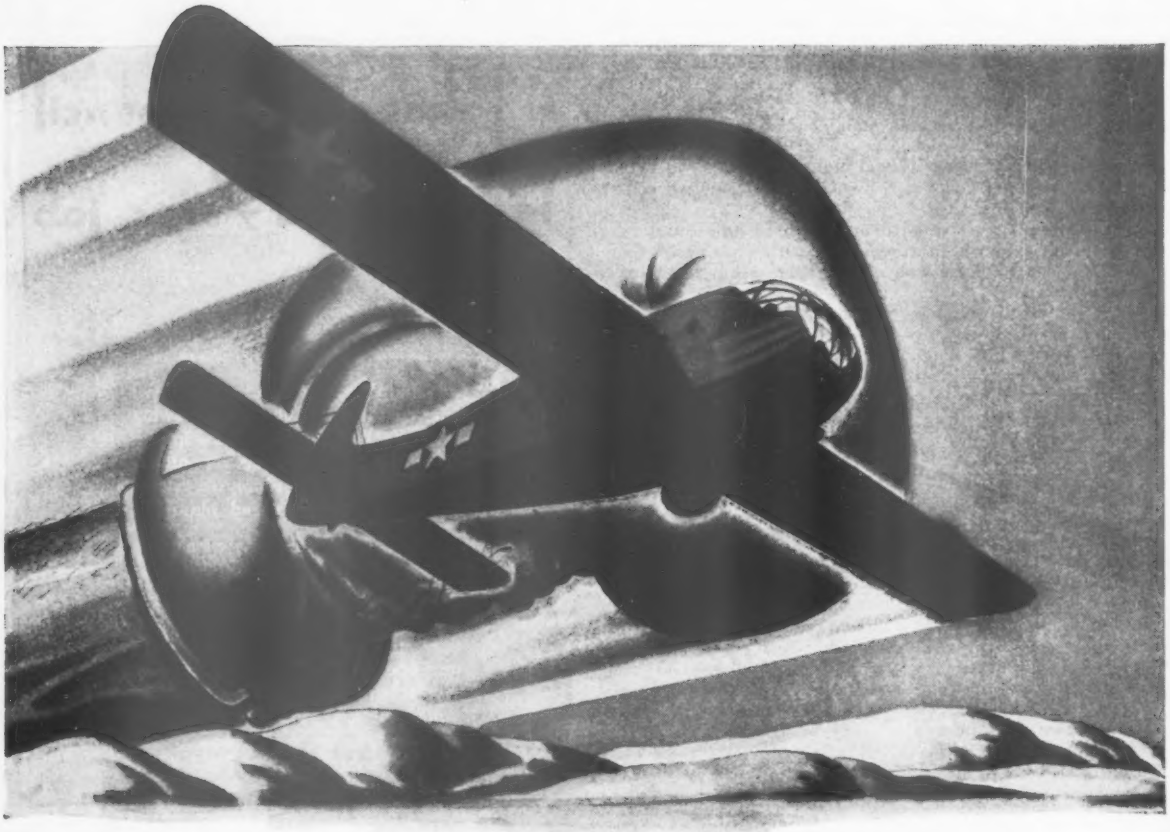


SUNDAY PUNCH!

The long period of "feeling out" the enemy is over. We have feinted and jabbed . . . taken a belt or two on the whiskers ourselves.

Now the time has come to start swinging from the floor . . . to try for a haymaker . . . *a Sunday punch!*

That's where the new CG-13 cargo-transport glider comes in. Third in the series of gliders designed here at WACO for the Army Air Forces, the CG-13 far outstrips its predecessors in size and capacity.

While we make no claims that the big CG-13 in itself is capable of providing a knockout wallop, we do believe that its ability to deliver vastly increased numbers of men and weapons to *and beyond* the front lines will be an important factor in landing decisive smashes.

And when this war is won, this same WACO engineering know-how and knack for design that has made the glider a tried and proved weapon of war, will produce the kind of postwar planes you'll want to own and fly—WACO planes. THE WACO AIRCRAFT COMPANY, Troy, Ohio, U. S. A.

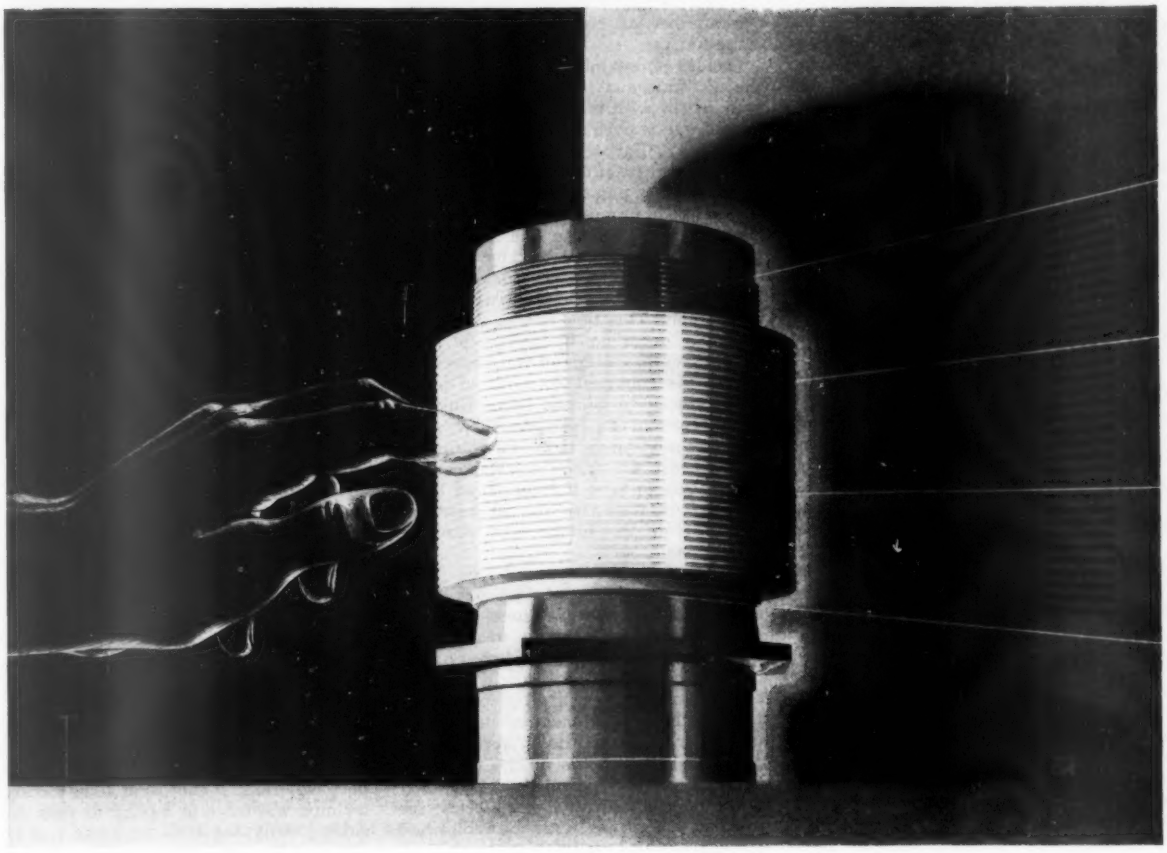
The WACO*-designed CG-13 glider is now being manufactured by The Ford Motor Company and Northwestern Aeronautical Corporation. Other* WACO *gliders are produced by* WACO *and eleven other companies.*

Waco

WACO AIRPLANES

ALL ARMY CARGO-TRANSPORT GLIDERS ARE WACO DESIGNED

POINTERS ON ENGINES . . . . . *No. 4 of a Series*



Off Comes the Lid of Aircooled Engine Power

A new and outstanding engineering development has come out of Fairchild's laboratories—a unique type of aircraft engine cylinder barrel that will enable American warplanes to fly farther, faster, and higher than ever before.

Heretofore, the power output of aircooled engines has been limited by the cooling capacity of fins tooled from the steel of the cylinder block—or of aluminum alloy fins merely *shrunk on* the cylinder barrel. The inefficiency of heat dissipation by these methods has long presented a problem for the best engineering minds of the world.

Now, by means of Fairchild's "Al-Fin" process*, a solution has been found. This revolutionary development makes it possible *chemically* to bond pure aluminum fins to the steel barrel to form an integral whole. The ferric-aluminum bond perfects the heat-conductivity at the point of contact. As a result, engine heat is drawn off much faster than by the methods previously employed.

Ranger 12s with "Al-Fin" cylinder barrels now produce more horsepower per pound of weight than other comparable engines.

The "Al-Fin" process is another example of the "touch of tomorrow" achieved by Fairchild engineering. A notable advance that helps build better warplanes today—as forerunners of better civilian planes tomorrow.

*All rights to the process are vested in Al-Fin Corporation, a wholly-owned subsidiary of Fairchild Engine and Airplane Corporation, and are available, under license, to others.

BUY U. S. WAR BONDS AND STAMPS

RANGER AIRCRAFT ENGINES

Division of Fairchild Engine and Airplane Corporation • Farmingdale, Long Island

(*Continued from page* 95)

When the tires finally did come off they were often damaged beyond repair.

Luther Mead, American Airlines maintenance foreman, had had enough of tire-changing backaches even before the war and sat up nights trying to work out ways to expedite the process. But he didn't perfect his solution until a few months ago. It consists of a low platform on casters on which a removed wheel drops when a plane is jacked up only one inch; an electric hoist that lifts the wheel to a working stand, and compound levers fastened to the rim and worked by a man on either side of the wheel. With little expenditure of human effort the levers turn the wheel two inches at a time and, in less than an hour, the tire is pried loose.

One air transport company's inventions these days are another's; there's a pooling of improvements, ideas, personnel and equipment undreamed of in the old competitive days when everybody had enough planes.

Pooled, too, in the national interest, are the resources of the greatest web of skyways in the world. If the planes were filled with Hollywood press agents hurrying to New York, or with perishable orchids, the airlines wouldn't really be at war. But a system of priorities established by the Government and administered by the airlines assures the movement of essential goods and persons. During the past year 70 per cent of all passengers on transcontinental planes and 40 per cent on all planes had priorities. A cargo priority has precedence over a non-priority passenger. A junior lieutenant with a priority can "bump" an admiral without one.

Ferry pilots have priorities second only to the White House. After they have flown Army bombers and pursuit planes from factories to embarkation ports they return posthaste, usually across the continent, to pilot and deliver again. This one service of the airlines has decreased the number of needed ferry pilots by three-fourths.

Besides maintaining regular schedules, the air transport industry plunged into war work with no conversion delays. Direct war service began a few minutes after Pearl Harbor was bombed, when the Department of Justice requested that all Japanese passengers be grounded. Orders went promptly to every plane in flight, and not one Jap had a chance to reach his safe deposit box by means of an airliner in the United States.

A week later the airlines were called upon again. This time it was a War Department order to fly troops to three vital places thousands of miles overseas. Within five minutes the required planes were radioed to land at once. Luxuries were removed to increase their cargo capacity; mechanics, tools and equipment went aboard; the upholstery was covered with sheets to save it from soiled boots. The planes were waiting at assembly points before the troops were ready to board them.

That was only the beginning. More and more the airline planes and airline personnel, from line presidents to grease monkeys, were called upon to carry the urgent supplies and the people our armed forces need around the world and, almost, from pole to pole. Not only were the planes requisitioned by the Army turned from commuters' ferries into globe girdlers, but the airline men who had been handling them so competently on the domestic airways were left at the throttles, the grease guns, the radios and the dispatching boards.

Airline planes and airline people played a large part, too, in the formation of Maj. Gen. Harold George's Air Transport Command for the Army. To a lesser degree they formed a part of the Navy's vast overseas transport service.

Although no American transport planes in years had entered Soviet Russia, the airlines got people like Harry Hopkins and Ambassador Davis to Moscow. They have made possible such gatherings as those at the White House between Roosevelt and Churchill and their responsible commanders and staffs brought in from every corner of the earth. Across Africa, transport planes pushed into deserts and jungles to prepare the way for other planes, by delivering steel mats, gasoline, gas tanks, mosquito netting, parts, tools, surgical instruments, dehydrated foods, and even tractors, bulldozers and jeeps. Not long afterwards, the line was moving on schedule like any of the domestic airlines. For this Brig. Gen. Tom Hardin, a veteran aviation authority and airline official, was decorated by President Roosevelt.

The lines were moving so smoothly and quickly by the time the President went to Casablanca that when TWA personnel flew him there, other TWA personnel, waiting on sealed orders, were dumbfounded. A pilot and co-pilot, after a long wait, had secured a bottle of dubious Scotch and were trying it in a first floor hotel room. After the first drink the co-pilot glanced out the window.

"Bill," he said to his senior, "throw that bottle away!! I—I—I—just saw Roosevelt go by in the street!"

Naturally these feats were not accomplished without a huge training program built around a skeleton force of air transport veterans. The first few months, training was more or less hit or miss, but subsequently the training project of all the member airlines were co-ordinated.

At Pan American's large school for navigators at Miami, men of the Army, Navy and ATC are leaving to guide their planes by the stars of both hemispheres.

The TWA 60-day course for mechanic commandos who have three to four months' previous Army training turns out TNT's—"technical 'n tough." The "tough" comes from Army drilling that continues throughout the course. The "technical" prepares men for the worst under any conditions. The classroom is an empty used car lot. Radio operators struggle against the kind of static they'll encounter in high altitudes. Engines are set up in a restricted working space under conditions typical of planes in service. Propellers must be repaired, not on specially constructed tables, but on the ground.

Planes also are being adapted to combat conditions. At airlines' modification shops military aircraft fresh off the assembly line get the aeronautical equivalent of plastic surgery. Necessarily identical because of mass production, the planes are revamped for their peculiar destinies. Some, headed for combat with Focke-Wulfs, have holes cut in their noses for lower windows and have their turrets altered. Some are winterized with rubber de-icers and cowl shutters for service in Alaska or Iceland; others are made dust-proof with special filters to guard against engine damage

(*Continued on page* 102)

Passenger's evidence of priority. Passenger signs on line "at originating station" when purchasing tickets, and on line "at subsequent station" when he checks in.

ATC-FT-49

U. S. ARMY AIR FORCES
HEADQUARTERS, AIR TRANSPORT COMMAND
PRIORITIES AND TRAFFIC
WASHINGTON, D. C.

PASSENGER'S EVIDENCE OF AIR PRIORITY

Date .....
From .....
To .....

Priority Classification No. .....
Priority Certificate No. .....
RAPCO (Code No.) .....
Military Orders .....

(*Check one*) **For Military Use**

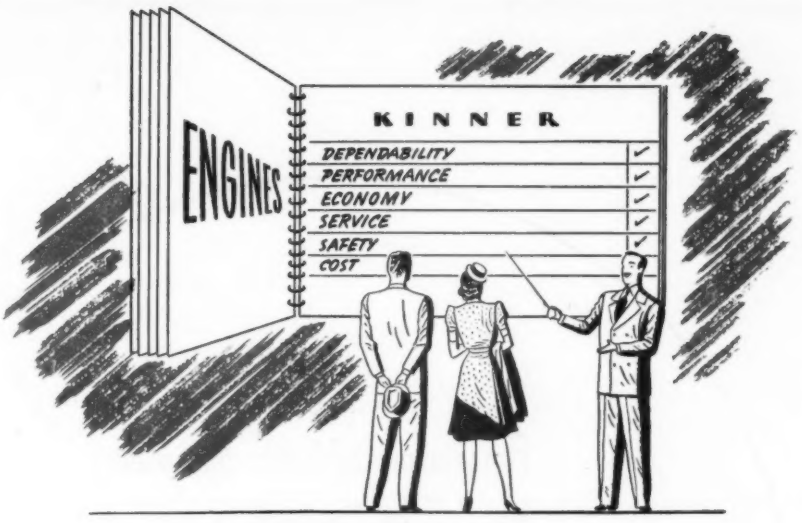
☐ Military orders: Special order No. .....
Paragraph No. ....., Hq. .....
Hq. address .....
☐ Leave or furlough orders (W. D. Circ. 39, 1943)
Hq. .....
Hq. address .....
Certificate signed by .....
Passenger's signature:
.....
Rank ..... Serial No. .....

For Civilian Use

I CERTIFY that this transportation is necessary to the prosecution of the war and that my mission can be successfully accomplished only by use of air transportation.

Passenger's signature:
.....
(At originating station)
.....
(At subsequent station)
.....
(Firm or business connection)

(SEE REVERSE SIDE FOR AIRLINE VERIFICATION AND INSTRUCTIONS) 16—37430-1



The Browns will Look at the Record

When Peace comes and Henry Brown decides to bring the air-age right into his own garage, he's going to be a mighty sharp shopper.

Because, the Browns and all other citizens who'll want to take their week-ends in the sky, will be buying their first airplane. And, they'll look at the record, not only of the ship they buy, but of the engine that powers it. They'll want to know the history of that engine, what it did in the war, where it won its spurs.

Kinner engines measure up to the yardstick the Browns will apply.* Kinner history began in 1919. It is one of very few American manufacturers that can point to a quarter-century of progress in aircraft engine building. Way back in 1926 a Kinner 5-cylinder radial engine received the *third* Approved Type Certificate ever issued an aircraft engine builder by the U. S. government. This prized license is still in force. Kinner now is supplying the U. S. government engines in quantity. Kinners give Fairchild, Meyers, Ryan, Howard and other training planes the dependable power needed in preliminary flight instruction. Kinners are supplied to the Canadian government for its Fleet Finch trainers; are being furnished many foreign countries.

Today, Kinner is producing equipment for war. Nevertheless, Kinner looks to the day *after* Peace when its 25 years of engine building experience, engineering ingenuity and skill, and ample plant capacity can be placed at the disposal of the Henry Browns all over the world, who will want to enjoy the air-age in their own way.

KINNER MOTORS, INC.
Glendale, California, U. S. A.

Radial and horizontally-opposed air-cooled engines—100 to 350 horsepower—for private, commercial, and military planes.

BUY WAR BONDS

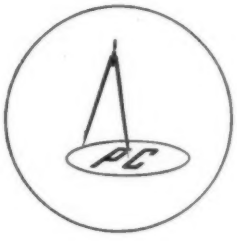
Kinner

* KINNER HISTORICAL HIGHLIGHTS

1919, company founded in southern California . . . 1921, built first 3-cylinder radial engine . . . 1926, received U.S. government's ATC *No. 3*, on first 5-cylinder radial engine . . . 1934, built first of its famous line of 7-cylinder engines . . . 1935, built first 14-cylinder engine to use 2-stage supercharging . . . 1943, completed a new plant hailed as one of the best planned and best tooled in the country . . . 1944, announced complete new line of horizontally-opposed engines.

Remember the battle that was lost "all for the want of a horseshoe nail"? Important little nail—wasn't it?

Piston rings are relatively small, too. But not small in importance to aircraft engine manufacturers.



The world's finest piston rings are standard equipment for these world-famous aircraft engines—Allison • Wright • Buick-built Pratt & Whitney • Packard-built Rolls-Royce • Franklin • Warner.

The Perfect Circle Companies

Hagerstown, Indiana • Richmond, Indiana • Newcastle, Indiana • Tipton, Indiana • Toronto, Ontario, Canada

(*Continued from page 98*)

from African sand. Among the famous products of a modification shop were the planes used in the first raid on Tokyo.

No one at the top is surprised by the way the American air transport industry has thrown its resources into the war effort. On September 1, 1939, the day Germany invaded Poland, Col. Edgar S. Gorrell, president of the Air Transport Association of America, rushed from a fishing trip in Canada to telephone General Marshall: "We are ready." In January of the same year, President Roosevelt stated: "Civil aviation is clearly recognized as the backlog of national defense." On May 15, 1943, the 25th anniversary of the air mail flight, he offered to air transport "the appreciation of all the people of the United States for a job well done."

For the rank and file, it's all in their day's work.

"What, exactly, have you done in your shop to keep each plane flying so much more?" I asked a foreman.

Later, he told me and showed me, but at first he only scratched his head. "Why, nothin', I guess," he said. "Except that we're all workin' harder!" END

Air Strategy in the Pacific

(*Continued from page 23*)

From the time that the American, British, French and Dutch warships forced their way through Shimoneseki Straits and the British destroyed the Satsuna Fleet in Kagoshima Bay, the history of Japan has been one of expansion. She started seizing islands nearest home, beginning with the Kuriles, running north to Kamchatka. The northernmost, Paramushiro, is the fortified base from which came the expedition which captured Attu and Kiska. South to Formosa she took over the Luchow Islands. She also occupied the Bonin Islands used for many years by American whalers. In the 1894-95 war with China she took Formosa and the Pescadores.

When in the military information division on his second tour of the Philippines, the writer captured from Philippinos secret agreements with Japanese agents working in the Philippines. As far back as the first revolt in the Philippines in 1896 the Philippinos had been promised aid from Japan. Among the reports of Gen. Arthur MacArthur (father of Gen. Douglas MacArthur) are statements showing that the Japanese extended aid to the Philippinos against us at the time of the insurrection of 1899. From that time they established a network of espionage against the day when they would throw us out by force.

The great difference between the air strategy possible in Europe and that possible in the Pacific and the Far East is due to the enormous distances in the latter theater.

On a clear day the Germans can see Britain and the British can see German-held France. In contrast, note the accompanying map of the Pacific on which is superimposed a map of the Atlantic with New York on top of Yokohoma.

To get at the Japanese, the problem of distance limits us to a number of suggested routes: the northern route via Alaska; the use of eastern Siberia through Russia; the route through Burma to China proper or to French Indo-China; or a direct route to the Philippines and thence to establish a base on the China Coast. The latter probably is the one selected by our military leaders.

The northern route across the Pacific where Asia and North America are separated only by Bering Straits leads from one largely unpopulated territory—Alaska—to another largely unpopulated territory—Siberia. Neither is anything more than a way station between the United States and Japan or China. From Seattle via the Aleutian Islands and Kamchatka to the main islands of Japan is 4,900 miles—or as far as from New York to Moscow via Newfoundland and Ireland.

The route from San Francisco via Hawaii and Midway to Yokohama is 5,300 miles—as far as from New York to Valparaiso, Chile. The route used by our *Clippers* from San Francisco to Honolulu, Midway, Wake, Guam and Manila is 5,630 miles. Since the war has robbed us of this route, our main flying route has been from Honolulu to Samoa, and then by various islands either to Northern Australia or the more thickly settled southern sections—a minimum of 8,000 miles.

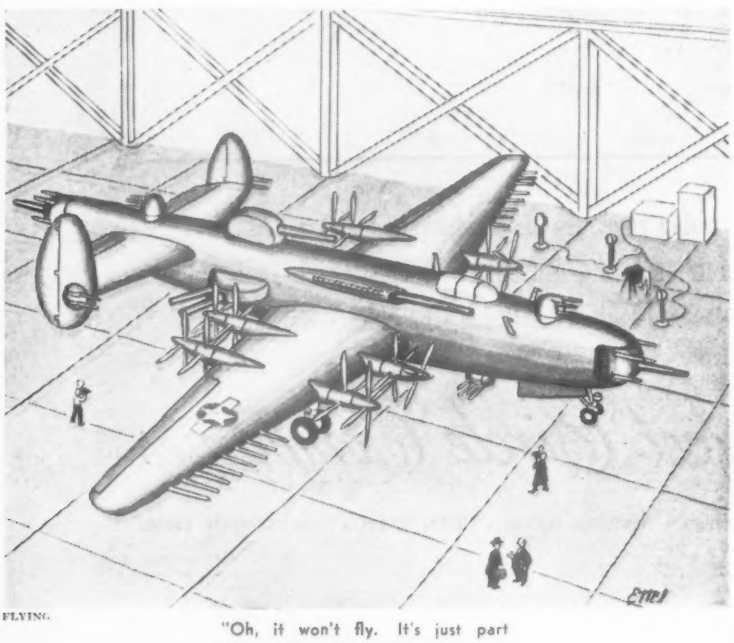
To get at Japan we must use Alaska, the Hawaiian Islands or Australia. From Brisbane to Yokohama is 5,000 miles. To fly it would necessitate our possession of bases in New Guinea or the Bismarck Archipelago, the Caroline Islands, the Marianas Islands and the Bonin Islands.

As long as Japan holds the Marshalls, Carolines, Palous, Marianas, the Bonin Islands and the Philippines we simply cannot establish the air bases necessary if we are to attack Japan by air—unless we are to do so from the continent of Asia.

As long as Russia has to fight Germany she undoubtedly will refuse us any bases in Siberia. The reason is simple: She does not want to fight on two fronts. She needs all her resources to fight Germany. She has had to take many of her troops from eastern Siberia where they faced the Japanese to strengthen her European front.

The Chinese have never been able to force the Japanese to take their troops from Manchuria to fight in China. Japan never had less than 400,000 troops in Manchuria. Because the frontier is on the Amur River, the Japanese in northern Manchuria occupy a huge salient jutting north into southern Siberia. The Japanese northern island of Hokkaido and her possession of the south half of Sakhalin Island leaves eastern Siberia from the mouth of the Amur south to Vladivostok in a dangerous salient with the Japanese to the east in these islands and to the west in Manchuria.

For years the Japanese have made every preparation to pinch off Vladivostok and eastern Siberia quickly by combined land, sea and air attack. If Russia permitted us to establish air bases in eastern Siberia besides having to fight



FLYING.

"Oh, it won't fly. It's just part of our 'Scare the Axis' campaign."

RIGHT ON THE TARGET

WITH THE HELP OF THE M-H AUTOMATIC PILOT!

The MINNEAPOLIS-HONEYWELL Electronic Autopilot not only improves the accuracy of precision bombing, but it also shortens the bombing run so that pilots can go into evasive tactics sooner.

Minneapolis-Honeywell was the first to apply electronic control systems to aircraft. The widely acclaimed Electronic Autopilot, however, is only one of a number of M-H electronic controls and devices in daily use on fighting planes in all theatres of war.

The engineering genius and skill responsible for these exclusive and important electronic control systems for war will contribute to the development of controls and devices for cargo and transport planes when the war is won.

Minneapolis-Honeywell Regulator Company, Aeronautical Division, 2948 Fourth Ave. S., Minneapolis 8, Minnesota. Branches and distributing offices in all principal cities.

ELECTRONIC CONTROL SYSTEMS
for the AERONAUTICAL INDUSTRY

MINNEAPOLIS
Honeywell
CONTROL SYSTEMS

Dear Flyer:
Believe me, I was plenty proud of you this morning! When I saw the allotment you have taken out of your pay for War Bonds, I wished the folks back home could see you. You figured it right, Boss, there's more than one way to axe the Axis, and there'll be dividends on both counts, later on!
Yours for long wear,
Your W.L. Douglas Shoe
U.S. WAR BOND
THE LEGIONNAIRE
No. 7618
$6.50 $8.50
Other styles $5.50
W. L. Douglas Shoes
W. L. DOUGLAS SHOE CO., BROCKTON, MASS.
Stores in Principal Cities
Good Dealers Everywhere
BUY ANOTHER WAR BOND TODAY!

in Europe at the same time, she would quickly find herself deprived of these areas and we would find our bases with their personnel and equipment lost to the Japanese.

Nor is Burma a good base from which to advance into China, if and when we recapture it. The country between Burma and China proper is one of the most difficult terrains in the world. Range after range of mountains with deep gorges containing rapid rivers would have to be crossed. When the Burma Road was open the maximum amount of supplies which could be carried over it was not sufficient to maintain a small air force in China and Chiang's maximum of perhaps 60 half-strength divisions of poorly-equipped troops.

Distance adds to the problem of terrain. From Mandalay to Chungking via the Burma Road is a thousand miles. From the neighborhood of Chunking to Tokyo is 1,800 miles as planes would fly. The latter distance is entirely too far for a large air force to operate in bombing Japan the way Germany is being bombed from England today.

In order to get near enough to carry on such bombing, Shanghai and the region along the Yellow Sea coast of China will have to be recaptured from Japan. This is beyond the capabilities of Chiang Kai-shek's army.

An army large enough to drive the Japanese out of this area and keep them out would have to be several times as large as Chiang Kai-shek's army and far better armed and equipped.

Both the Burma Road and the new Ledo road now being built together could not begin to supply such an army much less to bring in what is necessary to create it. The ground forces, materiel of all kinds and planes necessary to make aerial attacks on Japan similar to those being made on Germany would necessitate more transportation facilities than these two roads could ever furnish.

From Burma across to Indo-China is another difficult piece of country in which the roads necessary to carry on a real campaign and then to establish bases in French Indo-China simply do not exist. The same problem of being too far away from Japan for successful air attack obtain as in the region of Chungking. In fact, the logistic problem in any endeavor to get into China via Burma on a large enough scale to mount a real aerial offensive against Japan assumes proportions beyond our means.

When getting all materiel, personnel and supplies to Burma is considered, the problem is again probably beyond our capabilities. From our Atlantic seaboard to Burmese ports is 11,000 miles. From British ports the distance is not much less.

Therefore, until the time comes that Russia sees her way clear to permit us to use Siberia as a base, the only thing we can do is to keep on capturing Japanese islands and using them for air bases on which to prepare attacks on the next

(*Continued on page* 108)

"Y'know that little island we thought might contain enemy installations?..."

For *small* "see-through" parts, too—

PLEXIGLAS

Gunners on American bombers scan the skies through PLEXIGLAS, as nearly everyone familiar with flying knows.

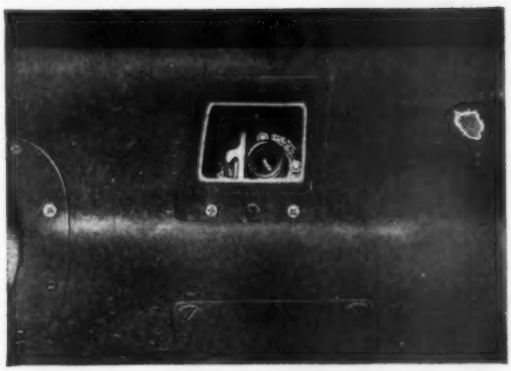
Not so well known is the fact that this acrylic plastic, product of Rohm & Haas research, has many other applications on airplanes.

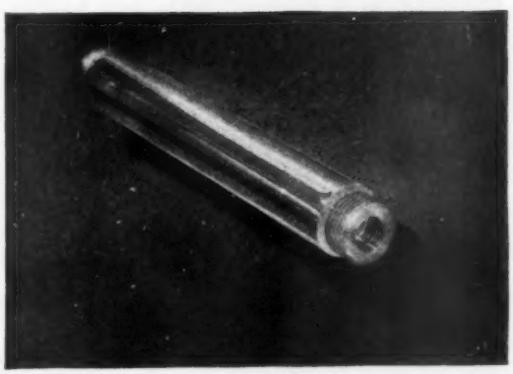
The crystal clarity of PLEXIGLAS, for example, is a boon to pilots who must fly with eyes ever on the fuel gauge...its great strength shields cameras from wind and weather in reconnaissance...its light weight, applied to a score of parts, saves precious pounds.

Some of these parts are formed and fabricated from PLEXIGLAS sheet; others are molded from PLEXIGLAS powder in fast production—like many of the crystal-clear parts on your prewar and postwar automobile.

YOU'LL OWN A PLANE SOME DAY. When you start shopping for your own plane after the war, pick one that's equipped with PLEXIGLAS parts and windows all around. Eight years of active flying service, much of it on combat duty with the world's greatest air force, is convincing proof that you can rely on the superior optical properties, the strength and weather-proof permanence of "Aviation's Standard Transparent Plastic."

Only Rohm & Haas makes PLEXIGLAS





ILLUSTRATIONS: (*Top to bottom*) Bombardier's panel for the Martin B-26, molded by Plastics Manufacturers, Inc.; Motion picture camera window for Republic P-47; Fuel gauges molded by Detroit Macoid. These parts are typical of many airplane applications utilizing the transparency, strength, and weather resistance of PLEXIGLAS.

PLEXIGLAS is the trade-mark Reg. U.S. Pat. Off., for the acrylic resin thermoplastic sheets, rods, and molding powders manufactured by Rohm & Haas Company.

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Getting 'Em Back, INTO THE BLUE!

A FIGHTING plane or bomber *in the air* is one of our most potent weapons; *on the ground,* as a weapon of attack or defense, it is worthless. The air corps begrudges every minute that a plane is tied up for reconditioning or repairs.

That is why a quick-disconnect coupling, developed by Thompson and now being made in great quantities for aircraft engine builders, is such an important contribution. With this new coupling, no time is wasted in bleeding the many fluid lines when making repairs. Oil, gasoline and anti-freeze lines disconnect with a quick turn and seal automatically as they uncouple. Power units can be lifted out, repaired or replaced—and precious time saved in keeping planes fit to fight.

The Thompson quick-disconnect coupling is only one item among hundreds of different precision parts and accessories made by Thompson workers. In this—a mechanized war—these parts are needed for every type of military equipment that uses internal combustion power. Thompson workers have the satisfaction of knowing that they have a part—a vital part—in every battle, on land, sea, or in the air.

The Thompson quick-disconnect coupling, originally designed for aircraft, is being adapted to other military mechanisms that use internal combustion power. When peace comes its use will be broadened far beyond its present military applications.

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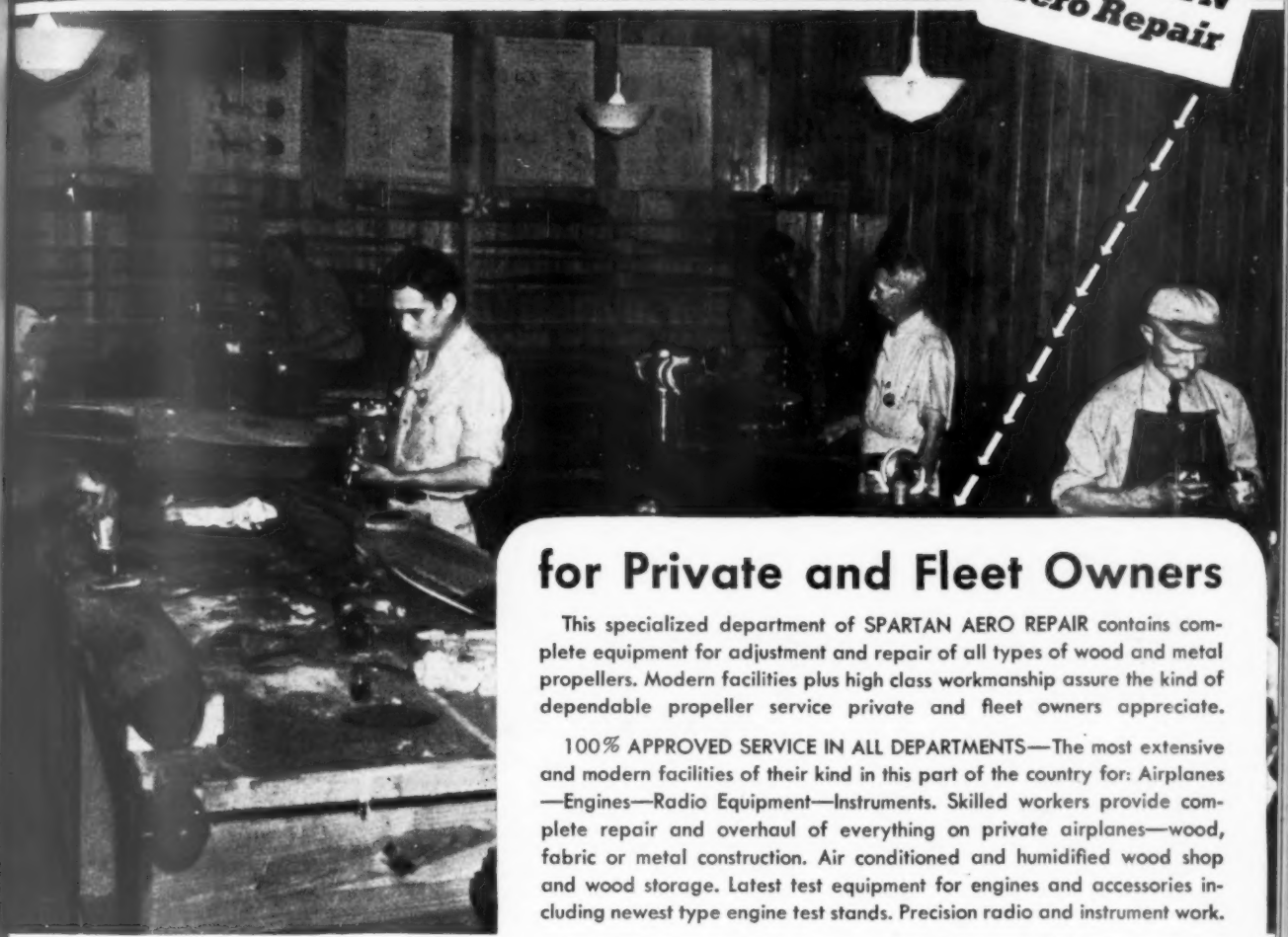

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This specialized department of SPARTAN AERO REPAIR contains complete equipment for adjustment and repair of all types of wood and metal propellers. Modern facilities plus high class workmanship assure the kind of dependable propeller service private and fleet owners appreciate.

100% APPROVED SERVICE IN ALL DEPARTMENTS—The most extensive and modern facilities of their kind in this part of the country for: Airplanes—Engines—Radio Equipment—Instruments. Skilled workers provide complete repair and overhaul of everything on private airplanes—wood, fabric or metal construction. Air conditioned and humidified wood shop and wood storage. Latest test equipment for engines and accessories including newest type engine test stands. Precision radio and instrument work.

Important war contract service to the U.S. Army Air Forces gets first call—yet private owners and fleet operators are assured every consideration and the same "ace high" service.

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Division of SPARTAN AIRCRAFT CO.

Established 1928 TULSA, OKLA.

Private Owners and Fleet Operators Can Depend on SPARTAN for Expert Overhaul Work at Reasonable Prices

(*Continued from page* 104)

group of islands.

As long as the Japanese hold islands throughout the western Pacific they are safe from attack on their homeland by us.

Failing the use of Siberia as a base from which to operate, the next best step would be to recapture the Philippines after restoring the old route from our west coast via Hawaii, Wake and Guam, and with the use, in addition, of the bases now held by Japan in the Marshall, Caroline, Marianas and Palau islands. We would then have a broad band of island positions across the Pacific entirely cutting off the Japanese in the Dutch East Indies.

From the Philippines across the China Sea to the coast of China from Canton and Hongkong to Amoy is a relatively short distance. It is only a 24-hour trip by ocean steamer and but a few hours by air.

As previously stated, the independent attacks by British and American aviation using Britain as a base are impossible in the Pacific. There the immense distances have emphasized what is not so obvious but is nevertheless equally true in the European theater, that in all combat the three elements of land, sea and air must be used as a united whole under a single command.

In the Pacific from the beginning, the Japanese owed their quick successes not only to the failure of the British and Americans to prepare for the war, which it has been obvious for 25 years was sure to arrive, but also because the Japanese used ground, sea and air forces combined under a single command for each mission.

In our earlier actions in the Solomon Islands where we first took the offensive, there was a tendency to disperse our efforts through failure to use all of our forces, no matter what their element, under one command to strike a united blow.

Our recent successful actions in capturing the Japanese Island bases show that in the Pacific, if not in the European theater of war, we have learned our lesson. MacArthur, by his successful use of combined forces under a single command in the south Pacific has proved the same thing, as have the recent operations at Kwajalein Atoll.

There is no reason why we should not go on taking island after island unless the Japanese fleet should choose to come out and risk a general engagement with our Pacific fleet. As our Pacific fleet grows, thanks to new warships being completed and to the ships made available by the surrender of Italy's fleet, the Japanese main fleet has less of a chance to engage our Pacific fleet successfully.

While we can keep on taking islands, we must remember that in each case up to the present we have brought to bear on the ground, in the air and at sea a force overwhelmingly larger than the Japanese forces we have met.

The Philippine Islands are large enough to be the base for considerable Japanese ground, sea and air forces. These islands begin just south of Japanese Formosa and, being the easternmost defense of the China Sea—now a Japanese lake—probably are a part of the main Japanese defenses. The Japanese Islands, Formosa and the Philippines block the coast of Asia from the mouth of the Amur River almost to Singapore.

As long as Japan holds them, her sea communications in the Japanese, Yellow, East China and China seas with the eastern seacoast of Asia and Burma are safe. On the American continent, this is a distance equivalent from Vancouver, B. C., to Ecuador!

By studying the map and following the step-by-step expansion of Japan, it is evident that since 1870 she has been building up her position so that she could blanket the coast of eastern Asia and control its commerce. The chances are, therefore, that when we have taken enough islands to attack the Philippines, we will have to be prepared to send a large force of ground troops and Army aircraft along with the fleet and its air arm.

From then on we undoubtedly will be in contact with a large part of Japan's army and air force, and perhaps her fleet. That is when the war with Japan will really begin. END

Post-War Private Planes

(*Continued from page* 29)

persons master this operation after sufficient practice, but since the condition is somewhat similar to a beginner learning scales on the piano before he can play music, it is rather boring. Considerable progress toward the answer to this problem was made immediately prior to the war in planes which had two controls interconnected so that the airplane automatically made the correct turns. A modified form of this system is sure to appear on some of the post-war private aircraft since the airplane is then much easier to fly and will be safer for those whose physical reflexes are only average.

As is natural, these characteristics are not obtained without paying a penalty—in this case in loss of maneuverability. The average person, however, is not interested in violent acrobatics.

Since we expect to have a much larger number of airplanes in use after the war than in the past, the visibility of the average airplane will have to be considerably improved to prevent serious accidents. Although a few courageous manufacturers have offered the pusher type aircraft and the aviation industry has discussed this for years as being inherently better than the conventional tractor type, a satisfactory solution of the problem from the performance and appearance standpoint has not yet been found. Since sufficient visibility will be obtained only with the pusher type installation, an aircraft of this general form will certainly be offered.

Accessories, such as flaps, slots, and spoilers, will be used where occasion demands and will be automatic in operation wherever possible to give the pilot the safety advantage each one offers and yet not burden him with a complexity of levers to operate while in flight.

The ratio of airplanes with respect to number of airports will increase rapidly after the war. There will not be sufficient good airports available and cow pastures and flight strips will be pressed into use. Since this type of airport will require

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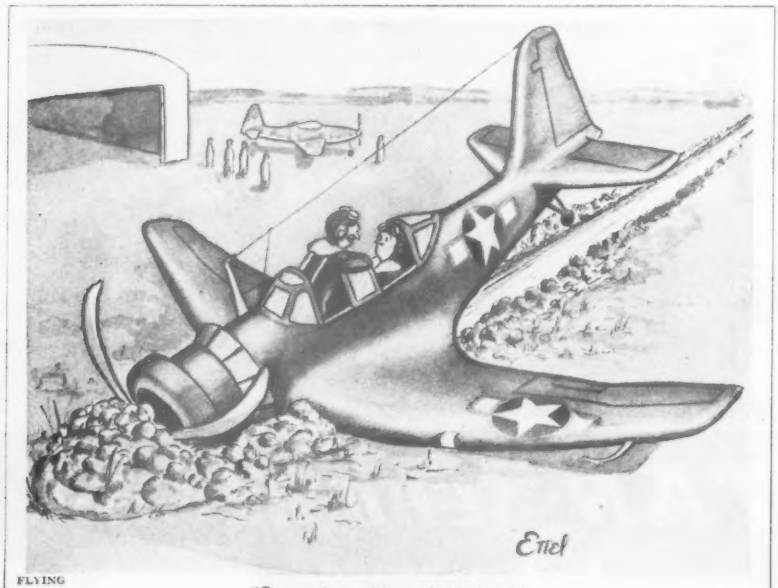
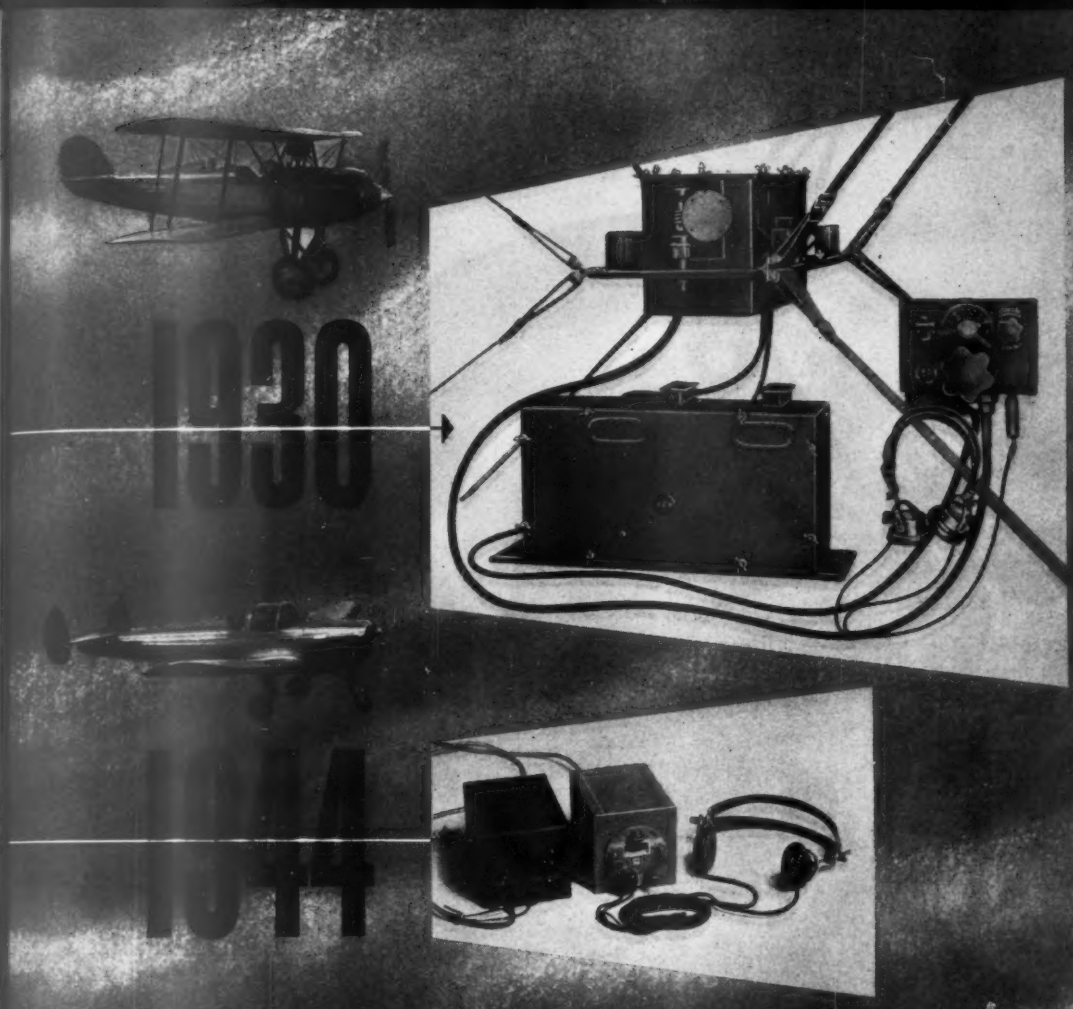


"Conserving rubber, eh Haskins?"



14 YEARS OF AVIATION RADIO

IN 1930 airplanes were "crates." Wire, cloth, slats. Mostly biplane. Wonderful, but fearful. Compare these old machines with the streamlined, compact safety models of today.

Year by year aviation radio has kept pace. Matched progress. Produced RCA aircraft radio that is lighter, that does more, that is more dependable.

For example, shown at the upper left is an RCA aircraft receiver of 1930. The equivalent RCA 1944 equipment is less than one-eighth as bulky and one-fifth as heavy. Yet it does a far better job and provides two frequency ranges (550 to 1500 kc. and 195 to 450 kc.), instead of the one range available with the 1930 apparatus.

This is a typical example of RCA initiative and ability in developing improved radio equipment. In the years to come this progress will be maintained in further development of RCA aviation radio that meets the most exacting requirements of military, transport and light plane service.

RCA AVIATION RADIO

RADIO CORPORATION OF AMERICA

CAMDEN, N. J.

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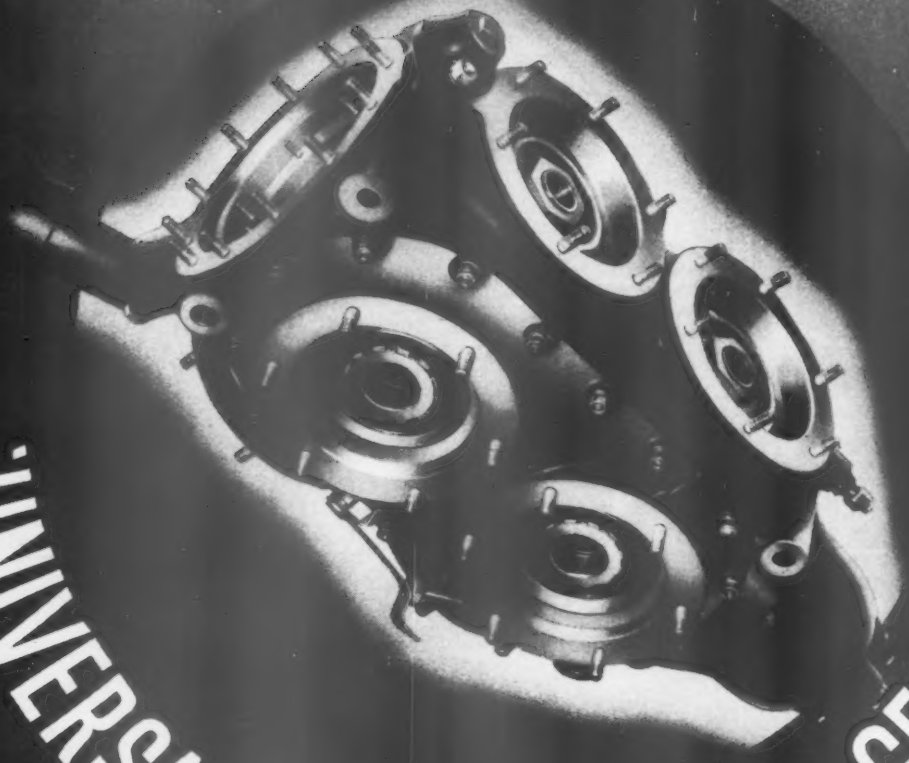

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Finish the Fight with War Bonds

Toward Tomorrow

Here is the plane that gave Americans a *new highway* . . . far up in the heavens . . . the Boeing Stratoliner, introduced in 1940 as the world's first high-altitude transport.

Perhaps in peacetime *you* had the thrill of journeying in one of these huge luxury liners along TWA's transcontinental route . . . *above* weather, high in the substratosphere, where flight is swifter, smoother, and surface storms are left far below.

Today Stratoliners are wearing the khaki of the Army's Air Transport Command, flown by TWA to the far reaches of the earth . . . to Africa and to Iceland . . . to Arabia and Australia . . . over the towering Himalayas, rooftree of the world, from India into China.

Madame Chiang Kai-Shek made her flight to America in a Stratoliner. Ambassadors, technicians and fighting men have hopped the oceans in them by the thousands.

Stratoliners are constantly carrying ammunition, mail, life-giving plasma to battle fronts everywhere . . . bringing back sick and wounded.

With its pressurized cabins and its advanced aero-dynamic design, the Stratoliner, a Boeing development of yesterday, is truly a forecast of the *planes of tomorrow* . . . another example of the engineering and manufacturing skill that produced such ships as the Boeing Flying Fortresses and the transocean Clippers.

This skill in many lines . . . structural, metallurgical, heating, hydraulics, acoustics . . . will some day be devoted again to peacetime products. And you may know of any such product: if it's "Built by Boeing" it's bound to be good.

DESIGNERS OF THE FLYING FORTRESS • THE NEW B-29 SUPERFORTRESS • THE STRATOLINER • TRANSOCEAN CLIPPERS **BOEING**

(*Continued from page* 108)

cross wind take-offs and landings, tricycle landing gears will become popular. This type of landing gear not only is dynamically stable, which the conventional type is not, but also further increases the visibility of the pilot. The tricycle landing gear will make it possible for roadable type aircraft to become available eventually for those persons who are willing to sacrifice performance and cost for this additional feature.

Weather and navigation are other hazards which are much more serious with aircraft than with surface vehicles, although these will not be solved by the airplane design proper. Navigation will be considerably simplified and the bad effects of weather minimized by the use of accessories, such as better instruments, radar, and as yet unknown new developments. Since it will take equipment of this type to increase the utility of the airplane so that the private owner can justify purchasing an aircraft, there will be a considerable market for it. In the aviation industry we expect these units to become available at a price which the private owner can afford.

Further, the immense experience gained and equipment developed in training an Air Force of more than 2,000,000 men will be put to good use in inexpensive and easy training of private owners for instrument flight so that they can use any of the new equipment.

Considerably more effort will have to be spent in developing a satisfactory product at the lowest possible cost than has been done in the past. When it is considered that the prices we are aiming at are very little higher than automobile prices and that aircraft dealers are entitled to as good a profit margin as the automobile dealers, it will be seen that these prices are going to be very hard to meet with the small production of the aviation industry compared with the automobile industry. However, a careful study leads us to believe that my suggested prices are not out of line.

Approximately 55.2 per cent of the airplane manufacturer's cost is beyond his control in the form of purchased equipment and material. Since this percentage is more than half the total amount allowed the manufacturer, he has two strikes against him at the start unless he can obtain the co-operation of his suppliers. Our post-war aircraft will be designed with the initial cost controlled as rigidly as other factors have been in the past. Further, aircraft models will be carried over from year to year, with minor changes, to amortize the high development and tooling costs which will be necessary to start out with a reasonable price.

"... And you can go straight down!"

Heretofore, the big disadvantage in owning a private airplane has been the upkeep. The actual operating cost of an airplane is not great. Any one of the two-place planes previously discussed will realize 17 to 18 miles per gallon at cruising speed but the indirect cost of $15 a month hangar rent, 10 per cent of the airplane list price per year for insurance, and the cost of maintenance work which must be done by licensed mechanics, considerably swells the owner's expenses once he has purchased the airplane.

We anticipate that these indirect costs will be decreased considerably in the post-war period. Already there is considerable talk of hangars with $5 to $8 monthly rentals. When safer aircraft are built, insurance rates will decrease. Also the large number of trained aircraft mechanics who will return from the Army Air Forces, and the increased number of aircraft in operation will lead to decreased maintenance costs. Further, post-war aircraft will be built out of more durable materials than the steel tube and fabric in use at present on inexpensive aircraft. An all-metal construction will no doubt be used by the majority of the manufacturers.

However, it must be realized that except in isolated cases the aircraft owned by the private individual will be at least a semi- if not a complete luxury for him.

Spectacular increases in performance from the pre-war models will be obtained only at a considerable additional cost. But honest cruising speeds of 100 to 120 m.p.h. in the lower-priced models will be a reality with perhaps 120 to 140 m.p.h. cruising speeds for the higher-priced models. Landing and take-off speeds of 40 to 50 m.p.h. will be necessary to allow the higher cruising speeds unless considerable additional cost in the form of complicated high-lift devices and additional power is accepted.

The performance of the airplane depends a great deal on the weight of the unit since the heavier the aircraft the more power is required to operate it—and power is expensive. In attempting to control weights, the airplane manufacturer is faced with the fact that approximately one-third of the empty weight of the airplane is beyond his control in the form of purchased items. Also, the future's aircraft will have to be more comfortable, smoother and less noisy, and this will cost additional weight. In order to obtain a more efficient aircraft, more engineering work than in the past will be required.

Although our pre-war designs on the whole have proved themselves capable of taking a beating under grueling operating conditions, there have been maintenance troubles on certain petty items which are very disconcerting to the owner. Since the complete aircraft is a very complex structure there is a possibility of an infinite number of things going wrong. A service test program similar to the automobile industry's proving ground will be instigated to catch as many of these "bugs" as possible before

(*Continued on page* 116)

EQUIPPING WORKERS with the fastest, safest, most accurate tool *for every hand tool operation* inevitably results in better, faster workmanship. Tools poorly adapted to each specific application waste time, skill, energy. Everywhere in industry, Snap-on tools are giving added efficiency to manpower in production, assembly and maintenance operations. Snap-on's direct-to-user tool service is available through 35 factory branches located in key production centers.

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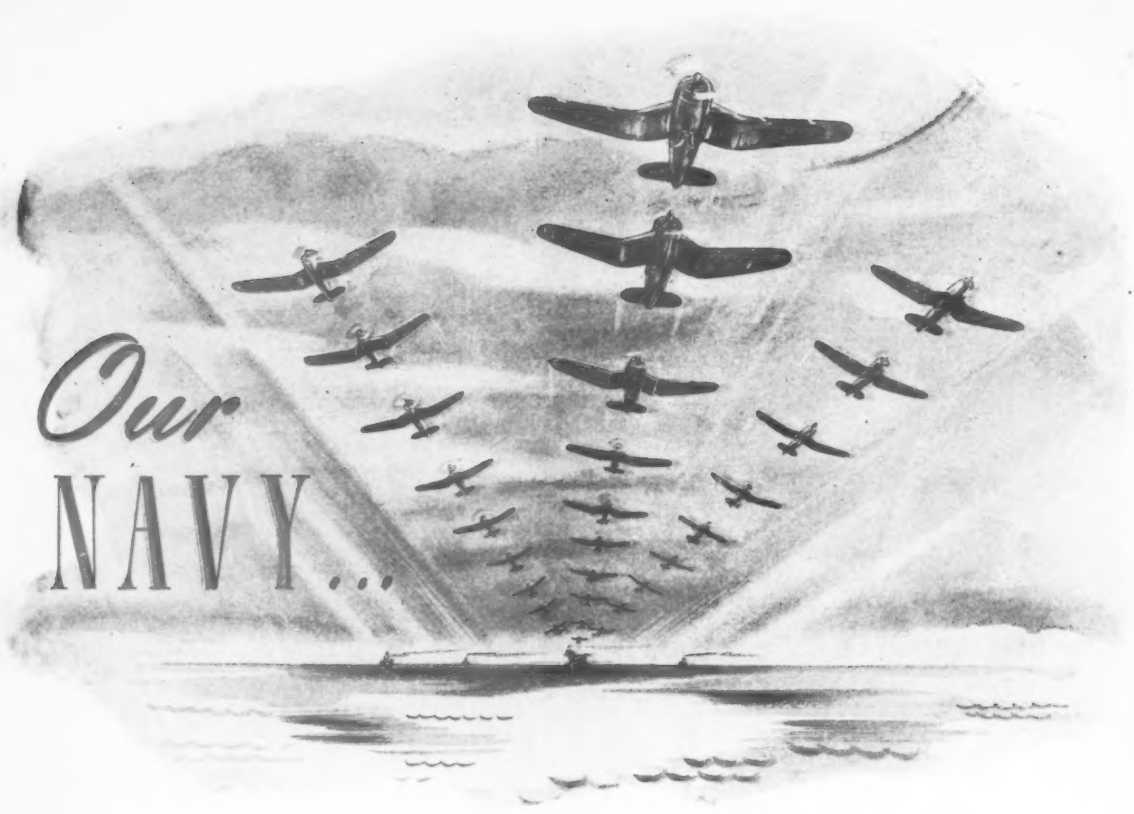


as strong as its wings

Every amphibious operation in this war has involved using the wings of the Navy to clear the way. And whenever those wings were strong, the landings were faster with fewer casualties. In fact, the initial landings in Africa, Italy and the Pacific Islands would likely have failed without those wings.

Here at ROMEC we are striving to do a thorough job building better pumps for those wings. That's the best contribution to the war effort the ROMEC family can make.

ROMEC PUMP COMPANY, ELYRIA, OHIO, U.S.A.

AIRCRAFT PUMPS and ACCESSORIES

ROMEC AIRCRAFT PRODUCTS

BUY MORE WAR BONDS

Romec AIRCRAFT PUMPS and ACCESSORIES

A Gift from Jerry!

The Hallicrafters built SCR-299 was moving along a North African road amidst a hail of bombs and shells. Concussions made the earth seem to heave and swell. The radio operator listening intently to a message coming through thinks "Jerry is giving us all he's got... will *all* the message come through or will part of it be lost?" Then came a mighty crash, the closest one yet. "Jerry is sure dishing it out . . . but the SCR-299 can take it!" Radio operators testify that the SCR-299 has operated through the most violent battle conditions. Rough roads, shock of concussions, heat and sand storms, twenty four hour operation, *and Jerry himself* could not stop the message from "coming through!"

BUY MORE BONDS!

hallicrafters RADIO

THE HALLICRAFTERS CO., MANUFACTURERS OF RADIO AND ELECTRONIC EQUIPMENT, CHICAGO 16, U. S. A.

(*Continued from page* 112)

the aircraft is put into the public's hands.

The basic structure of our pre-war aircraft has been satisfactory. It is very seldom that a structural failure occurred; the main troubles came from the so-called accessory items. The experience gained during the war in developing such accessory items to withstand the extreme conditions of wartime use will be of immeasurable benefit in eliminating most of the difficulties in the post-war period. All-metal construction will further decrease petty difficulties.

There is room for considerable improvement in the comfort of the pre-war private aircraft. Thorough studies of exhaust muffling, vibration, sound-proofing, air conditioning and seat construction will be made so that the post-war private airplane will be as comfortable and as pleasant to ride in as an automobile.

The main difficulty in obtaining comfort in an aircraft is sufficient room. Since the performance of the airplane is a function of its size, the designer is reluctant to make the aircraft any larger than the bare minimum. If he does he cannot meet the performance of his competitors. Although aircraft with sufficient room have been built, the performance has been so impaired that they have not sold as well as their less comfortable but faster competitors. A possible solution to this is the use of more efficient and lighter, but higher-powered engines, so that the extra-sized aircraft can be dragged through the air at a reasonable speed and cost. Until such power plants are available, however, performance will be partially compromised for comfort. END

Bombing Proof

(*Continued from page* 45)

Progress of U-boat building by the enemy is followed in detail. Launchings, slip openings and construction are all revealed. Airplane manufacture can be checked and in fact all new models of enemy aircraft were first seen in reconnaissance photographs before they were encountered by our combat pilots.

From such photos it has been possible to determine the performance of new types of aircraft with reasonable accuracy. New kinds of tanks, landing barges, guns and every kind of military equipment have been spotted in parking yards. When daily runs over railway yards reveal an increased amount of traffic, military interpreters know that something of importance is about to occur.

One of the outstanding and most recent discoveries was the large German synthetic rubber plant at Huls, near the Ruhr. The photographs were obtained by a pilot returning from the Ruhr after he let his cameras run on the homeward flight from a target and accidently picked up the plant on the way.

As a result, larger scale photographs were requested and it was realized at once that the large factory shown did not conform with anything so far located. It was known, of course, that the enemy was setting up a synthetic rubber industry so a guess was made that the factory was probably connected with this, particularly as coal and oil were clearly used in the process. The next step was to find out as much as possible about the probable process of producing synthetic rubber (Buna) and to apply this knowledge to a study of the layout of the works. From this study a detailed plan of the factory was prepared which indicated vital points. The most vulnerable point was a large boiler house in the center which produced steam at 13,000 pounds pressure to drive the power station and in the manufacturing process. This pressure was determined from the photograph by an expert.

Accordingly, when the plant was attacked by *Flying Fortresses*, this boiler was made their aiming point and was so successfully hit that an enormous column of steam shot up to 7,500 feet.

Subsequent photographs taken immediately after the attack confirmed the damage. Photographs taken four months after the attack showed that the enemy was not even trying to repair the works. This is hardly surprising, as the boiler house took about two years to build. The importance of the attack can be gauged from the fact that Germany has only three plants producing synthetic rubber—at least located so far.

Another example was the attack on Friedrichshaven. The enemy had been using a large basket-type radio direction finding apparatus to plot our bombers both by day and night. It was obviously important to hinder production of these since they have only been available in sufficient quantities for the coastal areas and more heavily defended targets. Photographs taken of Friedrichshaven one morning showed that the old Zeppelin works had been converted to the production of this apparatus and that no less than 250 pairs could be seen in the open. Accordingly, a night bombing attack by *Lancasters* was immediately planned with successful results, the *Lancasters* actually landing in North Africa after the attack.

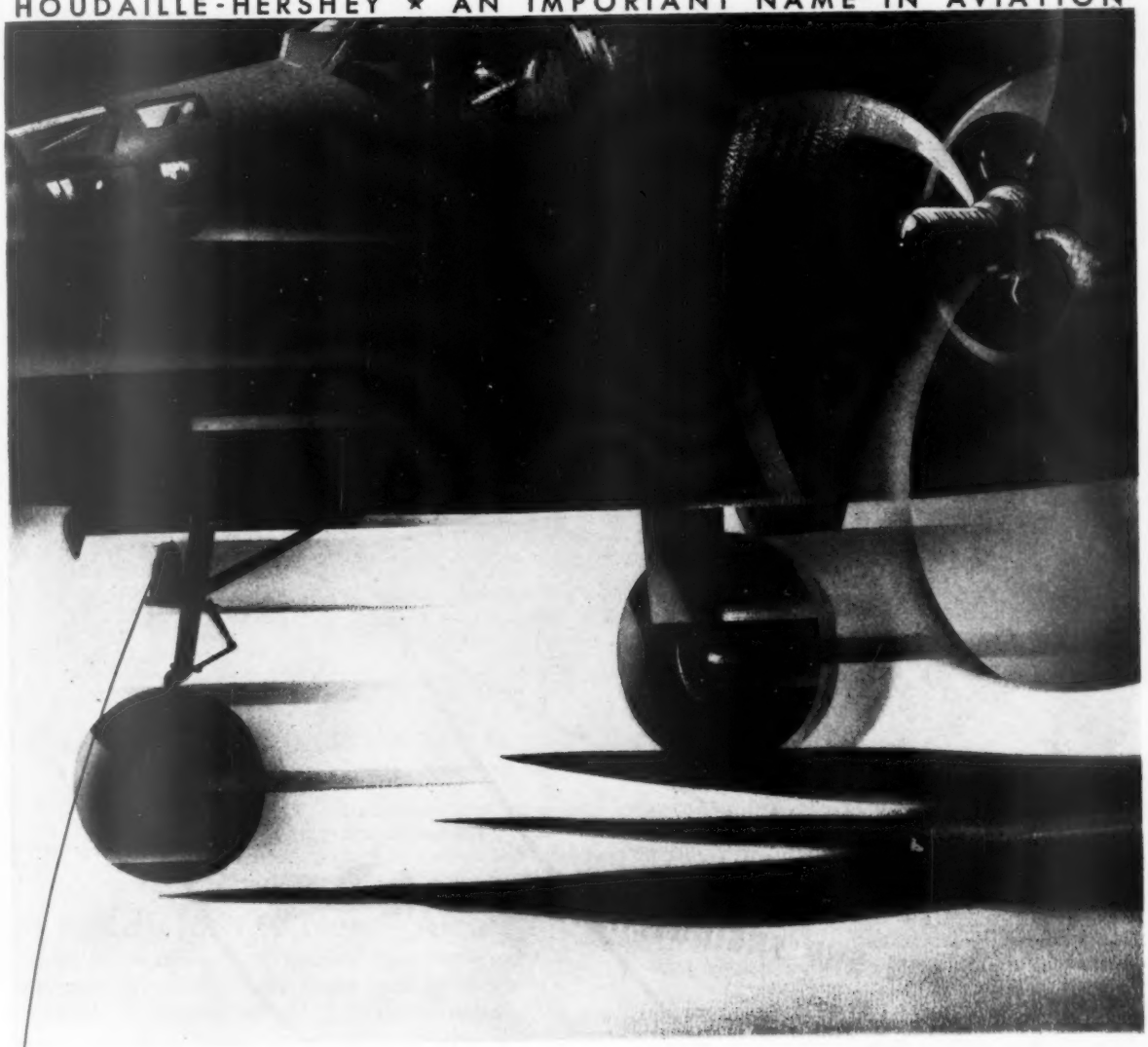
This was a gratifying success to the reconnaissance group since the instruments made at this plant were used to detect the lone unarmed "eyes of the army".

Mapping an enemy-occupied territory is an important part of the work. Napoleon uttered only a half-truth when he said that an army marches on its stomach. It also marches on maps. The area of a new map used to be limited by the vision of an observer on the ground—a matter of a few square miles at the most. Such

(*Continued on page* 120)

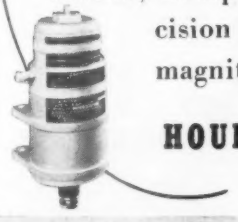
"That new gun has some kick, huh?"

HOUDAILLE-HERSHEY ★ AN IMPORTANT NAME IN AVIATION



A little giant for a BIG job

● To control dangerous shimmying forces on the nose wheels of fighters and bombers, the tail wheels of huge cargo planes, is the job of the Houdaille* Hydraulic Shimmy Damper. It is a relatively small, compact precision instrument, but it tames forces of great magnitude—a little giant for a BIG job, in fact.



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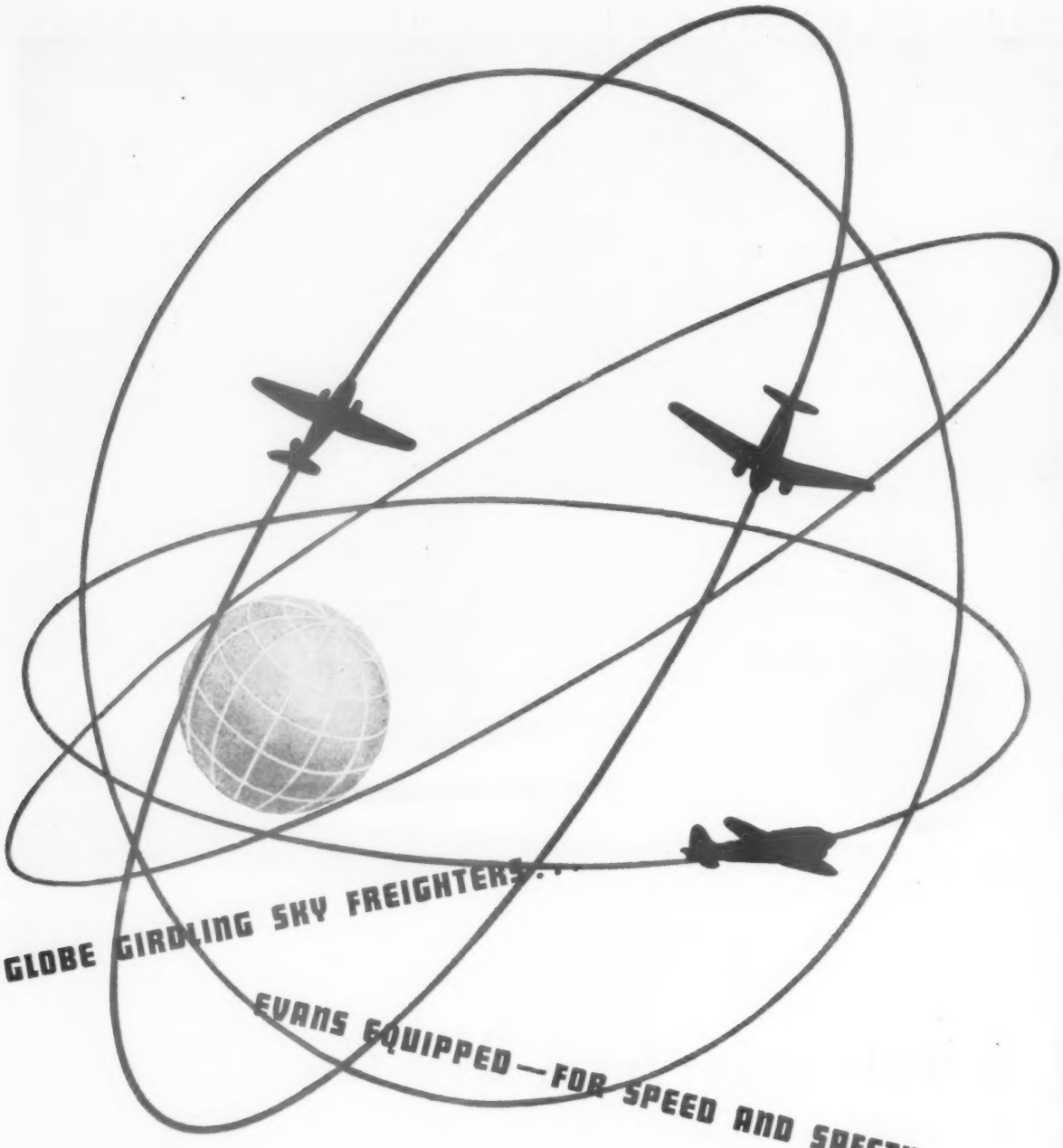

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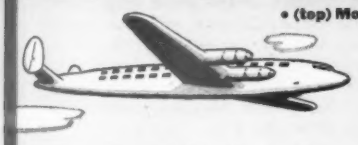

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Spartan trained men are now distinguishing themselves in all of these vital flying jobs—*and there's a place for you!* Then, with the coming of peace, you can be ready to step into an important place in aviation—the most promising career field of the century.

Here are a few of the many reasons why young men are coming to Spartan for flight training: A fleet of 18 modern training planes—a location in the heart of the nation's finest flying country—private practice fields—light, airy classrooms—29 modern buildings located on 50 acres—fully equipped shops and laboratories—skilled instructors who assure you the actual experience and thorough knowledge you must have for a successful life-time career.

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- ☐ Private Pilot
- ☐ Weather Forecasting
- ☐ Women's Instrument Technician

(*Continued from page* 116)

maps were hit-or-miss, trial-and-error products at best but today the photographic airplane is aiding the military mapmaker in producing more accurate military maps than have ever heretofore been available to military forces.

Long before an armed force lands on enemy territory the staffs can have in their possesion—within a few hours if necessity demands—maps so accurate that gun ranges and bearings can be calculated.

Photographic reconnaissance and mapping units have prepared maps which will be issued to the first troops ashore on the second front.

These are only a few examples of the incredible work being carried on by our photographic reconnaissance units.

The following is how a typical photographic reconnaissance mission is flown:

1. Request for photographs is sent to the central organization.

2. These requests are pooled with others, duplication is eliminated, missions are combined, etc.

3. Each separate mission is approved and assigned.

4. The intelligence section combines all information available about the target and all the information the pilot may require: weather, previous photos, maps, warnings about defense, and so forth. (Some missions are done as routine, runs being made periodically.)

5. A headquarters schedule is made out for all these assignments and pilots and planes are assigned.

6. The individual pilot is given his instructions plus food boxes.

7. The run is made.

8. Upon his return the pilot is interviewed at his plane for facts about weather over the target, height at which shots were made and other matters which might help in developing and first viewing. These facts are noted on the film container and the rolls are rushed to the laboratory for development.

9. Pilot reports for a more complete interview. He describes what he thinks he got, what resistance he met if any, what flak, what he saw of interest, etc. This report, together with a map on which the pilot's course is marked, is sent to the interpreters.

10. Pilot reports briefly to weather officer, confirming forecast or giving information useful to those going on missions to follow.

11. In an average time of 40 minutes the negatives are ready for viewing. This pre-viewing enables intelligence officers to eliminate negatives of little use, thus reducing printing and speeding discovery of important enemy movements the film may reveal. (Fast "wet prints," made in three minutes, can be had to confirm finds.)

12. Finally, three sets of prints are made: No. 1 goes to Secondary Interpretation for more detailed examination; No. 2 goes to plotters or others having immediate use for them; No. 3 is kept at the center for further study, comparison with previous films of the same target, etc., and filed. Old sorties are often called for.

Some fighter pilots shy away from photographic duty because they think that flying without guns takes them out of actual combat. Nothing could be further from the truth. After a pilot makes this group he finds it is one of the most exciting and important jobs in the air. After a bout with the intercepters in which he uses skill and every advantage of the *Lightning*, the pilot runs over the target at 30,000 feet. At that altitude the flak is devilishly accurate. Sometimes the pilot goes to 40,000 but flak has even followed him up that high. Sometimes, for a better shot, the pilot will do some "dicing"—diving low over the objective. This is dangerous, of course, but of the small percentage shot down, over 50 per cent of these pilots report later from prison camps.

Colonel Hall is typical of the pilots flying reconnaissance. He is not only a great flyer and recipient of the Croix de Guerre with Star and Palm in World War I and the Air Medal with Oak Leaf Cluster and the Distinguished Flying Cross for his services in the present conflict, but he has inspired every member of his group to work far beyond the call of piloting. It has been told that pilots in his group, after a mission, go from the intelligence inquisition directly over to the lab to look at their pictures. They hound the interpreters for information and become expert photographers themselves, even though the complex five-lensed cameras work automatically.

The cameras make 9x9 or 9x18 negatives. An adjustment for speed and altitude guarantees a perfect series of prints with a 60 per cent overlap. An automatic pilot holds the plane steady over the target but the human pilot has plenty to do sighting it and looking for enemy fighters at the same time.

Photo reconnaissance missions are no easy job but ask the man who flies one—he loves it and he likes knowing that the rest of the Air Force—as well as the Army, Navy and Marines—depends on him to show the way. END

Latin America Moves by Air

(*Continued from page* 54)

The present and future development of aviation in the other American republics, it should be remembered, is a joint task which depends as much on the citizens of those countries as on U. S. enterprise. Of the route miles flown in 1942, only 52 per cent were accounted for by U. S.-owned companies.

To mention just a few typical native routes, there is the Laso Air Line of Argentina, operating twice a week service between Buenos Aires and Asuncion, Paraguay; twice-daily air service between Buenos Aires and Montevideo jointly operated by Uruguayan and Argentine air lines; and a Brazilian air line operating from Porto Alegre weekly to Buenos Aires and twice a week to Montevideo.

South America also has resources of its own in the way of aircraft manufacturing facilities, pilot training programs and organized flying activity, all of which will contribute to the growth of air transportation.

Outstanding on the manufacturing side is the new National Motor Factory of Brazil, which soon goes into production. This $9,000,000 plant is the first in Latin America to build airplane engines from start to finish. At a site where just a year ago a crocodile was killed by Air Brigadier Muniz, moving spirit of the undertaking, 450-h.p. Wright *Whirlwinds* will soon roll off a line which has a capacity of 1,000 engines a year on the basis of two-shift operation. A contract has also been signed with Fairchild Engine and Airplane Corporation to build the six-cylinder *Ranger* in-line, air-cooled engine at the factory. The U. S. is giving lend-lease assistance.

General Muniz looks forward to an airplane factory growing up beside the motor works and turning out plastic-wood cargo planes like the Curtiss *Caravan* with the use of Brazilian woods. In anticipation of fly-away sales, he has constructed an airport which ultimately will be two miles long.

Brazilian engineers who studied at the Wright plant in Paterson, N. J., with the aid of North American experts, are now teaching 1,000 selected workmen the craft of engine-building. Modern homes and apartment houses to care for an eventual community of 25,000 are being erected at the site which already boasts a new hospital and co-operative store.

In addition, Brazil has three companies making light planes, primarily for use in the government's civilian pilot training program. They power their craft with Continental, Franklin and Lycoming engines of 50 to 100 h.p. Companhia Nacional de Navegacao Aerea, which began operations in 1942, has submitted plans to the government for production of 1,000 trainers.

Argentina's national aircraft factory at Cordobas, under the supervision of Army engineers, makes the *Boyero*, in which is installed a 40-h.p. American engine. The plywood *IMPA*, a name formed from the initials of the manufacturing company, Industria Metalurgica Plastic Argentina, is produced for clubs and private pilots. It utilizes a 65-75-h.p. Lycoming or Continental engine. One other Argentine firm is in the lightplane field.

Mexico has several large assembly plants where planes are manufactured from parts produced in the United States. There is also a company in Mexico City which makes the Teziutlan, sleek-looking plastic plywood lightplane designed by Antonio Zea and Brig. Gen. Roberto A. Fierro, chief of the Mexican Air Force.

For trained personnel, the other American republics in the past have been forced to look outside their borders, but recent developments point to use of native talent in further aviation expansion. Approxi-

(*Continued on page* 126)

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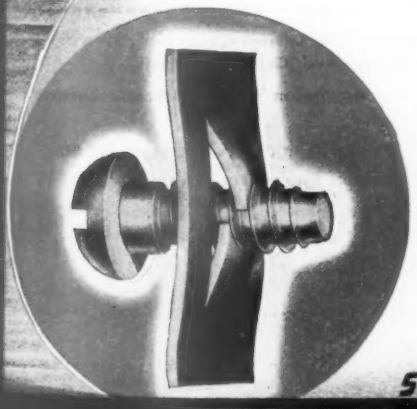

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For use where no storage battery is installed in ship, two other sizes of transmitters are available. The Model 203 is rated at 1.5 watts antenna output; batteries and transmitter are in the same cabinet. The Model 204 is rated at 4.5 watts antenna output; has separate dry battery power supply.

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(*Continued from page* 120)

mately 350 young men have returned to their home countries as flyers or mechanics. Following the CAA model, Mexico has established two pilot schools and Brazil has a civilian pilot training program with 1,000 enrollees a month.

Civilian flying clubs are also contributing to the creation of potential airline personnel and private aircraft purchasers. In a period of 18 months, 326 such clubs were organized in Brazil through a campaign conducted by the Assis Chateubrind newspaper chain. Newspaper readers of Brazil have donated more than 200 planes to these clubs. Located in virtually every part of Brazil, the clubs have trained 600 pilots with 500 more under instruction. Two clubs in Rio de Janeiro alone have a membership totaling 10,000.

On the debit side of the ledger, Latin America lacks certain facilities that are essential to the full growth of aviation—good weather-reporting services, navigation aids for night flying, adequate airports and, temporarily, airplanes of the right types and in sufficient quantity. The United States is assisting in filling all of these needs.

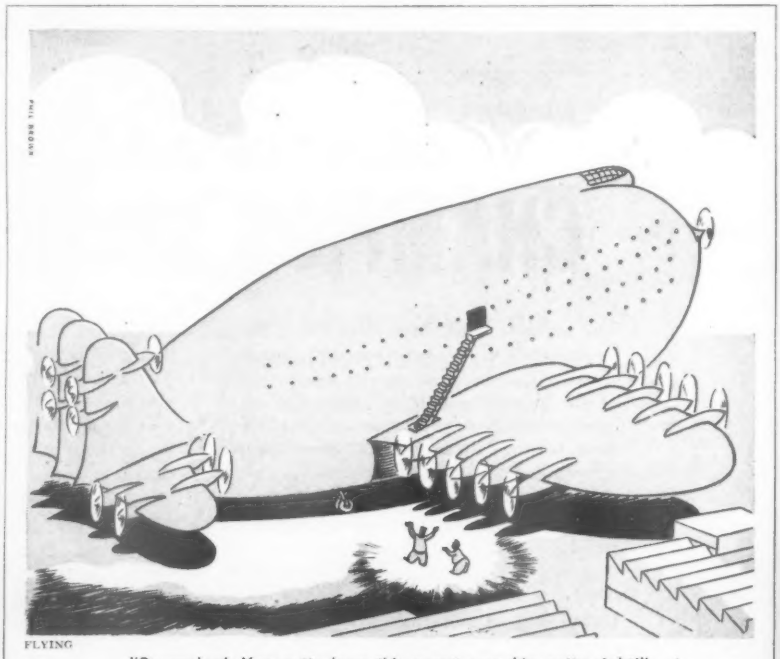
Weather behaves differently as one goes toward the equator. Some pioneer work in revising forecasting principles to fit tropical conditions had been done by the commercial airlines, and Argentina and Brazil long maintained excellent meteorological services, but until recently no systematic co-ordination of effort had been made. Lately, however, there has been established the Institute of Tropical Meteorology at the University of Puerto Rico, to conduct research and train forecasters in this specialized field. Another forward step was the course in meteorology for 200 students from every Latin American country at the University of Antioquia in Medellin, Colombia. This Inter-American group studied under instructors from Brazil, Chile, Costa Rica, Ecuador, Guatemala, Uruguay and the United States. The course was under direction of a joint committee on which were represented the U. S. Weather Bureau, U. S. Civil Service Commission, the State Department, and the Co-ordinator of Inter-American Affairs, with a grant of $280,000.

Airport facilities are surprisingly backward in relation to the generally advanced development of aviation. Construction of U. S. Army air bases, however, will leave several of our Allied republics with first class ports for post-war use. Outstanding is the Parnamirim air station, 15 miles from Natal on Brazil's northeastern bulge. This is larger than La Guardia Field, complete with hangars, shops and living quarters. Peru is getting an improved airport system under a contract with the Defense Supplies Corporation aimed at developing the rubber industry.

A third gap in South America's aviation lineup is navigational aids to make night flying possible. The trip from Miami to Buenos Aires now consumes 80 hrs. 15 min., about half of which is spent in night stop-overs at Port of Spain, Trinidad; Belem, Brazil, and Rio de Janeiro. Only regular night flying in Latin America is between Los Angeles and Mexico City, and on the northern part of the Belem to Rio de Janeiro route. In addition, there has been an experimental night flight between Mexico City and Merida, some 500 miles to the southeast.

General Salinas, Mexico's chief of civil aeronautics, has made a close study of the CAA airways in the United States and indicated his intention of tying Mexico

(*Continued on page* 130)



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These "Ugly Ducklings," as they are known affectionately to the men who work them beachward in the face of enemy gunfire, are one of the most startling types of ship the war has produced.

Born of American ingenuity along the banks of the Mississippi, the LST (Landing Ship, Tank) was only on the drawing boards a mere two years ago. The first model was completed in October, 1942. Yet so vital are these "Ugly Ducklings" in today's amphibious warfare that production of landing craft has been given an overriding priority over all other urgency programs.

Knowing the vital importance of absolutely accurate navigation and trustworthy steering, our Navy equips every LST with the Sperry GYROTRONIC Compass, the famous Mark XIV. And as a result of experience gained in Africa and in the Pacific, the Sperry Electric Follow-Up Steering Control is specified for those currently being delivered to the Navy.

Such large numbers of these two precision devices (designed, developed, and manufactured by Sperry) are now being used that no one company can possibly produce them all. So, Multiscope, Inc., of Coffeyville, Kansas, is making the complete Steering Control for Sperry under subcontract, while the Dodge Division of Chrysler Corporation is helping to supply quantities of Sperry Gyro-Compasses, under prime contract to the Navy.

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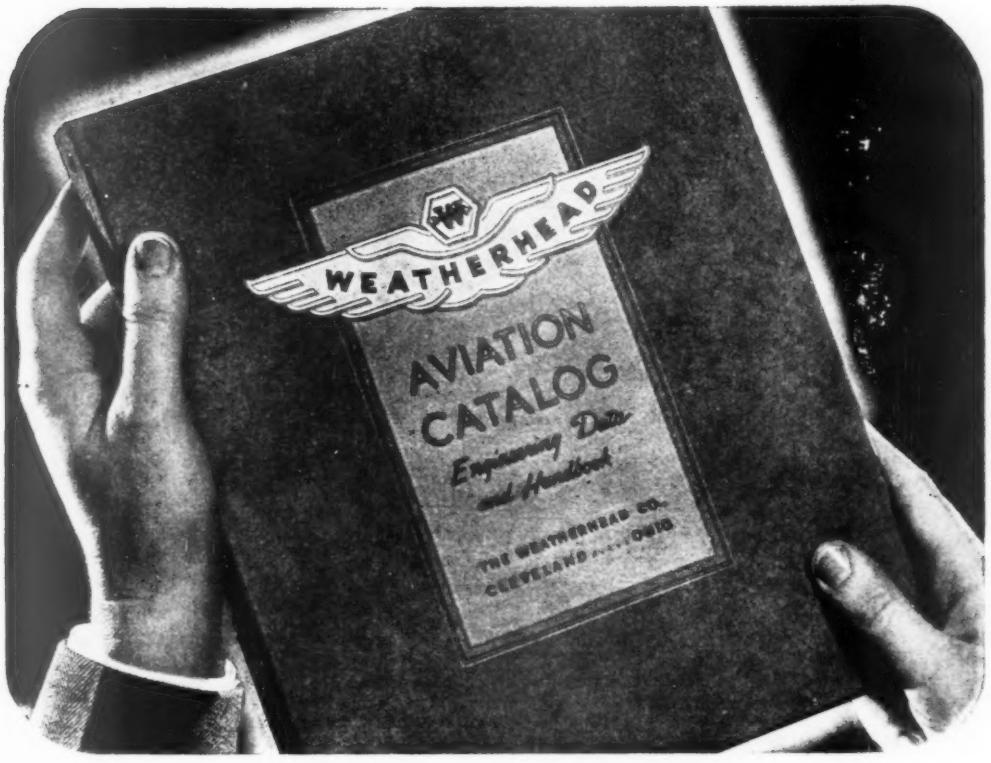

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(*Continued from page* 126)

in with this system which already connects with that of Canada. The beginnings of a hemispheric network of radio aids can be seen in this arrangement.

A Congressional committee report in 1941 cited the distances involved, the ruggedness of the terrain, and the absence of electrical current as making it "doubtful whether either lighted airways or radio beam courses for most sections of South American airways can ever be developed". Later experience of the Army, aided by CAA engineers, in putting radio ranges across Africa and in other remote portions of the world, indicates that the installation problem can be licked and that current, as the committee has probably learned since, can be supplied by portable generators.

Finally, South America needs airplanes. This problem, of course, is universal to civil aviation during the war. A trickle of transports has been released by the War Production Board for Latin-American use, but a hungry market awaits our aircraft makers at the war's end. It is a market based on a wide variety of needs which sales departments probably are giving close study. Chile, for example, can use planes with a rapid rate of climb, capable of vaulting the high mountain range which, only a short distance inland, parallels the long coastline. For Venezuela, seaplanes or float-equipped lightplanes are indicated by the location of its important industries around the shores of a large lake. Similar equipment might be used along the Amazon.

These are the vistas for Latin-American aviation a little more than 25 years after Lieut. Dagoberto Godoy of the Chilean Air Force startled the continent into awareness of its aviation possibilities by flying across the Andes and back in a single-engined open-cockpit airplane. END

Pigmy Gauge

(*Continued from page* 47)

jigs. Were you to visit Convair test laboratories, you would see feminine hands deftly manipulating the wire, so small as to be almost invisible, winding it into double and triple and quadruple grids, using only enough to attain the desired resistance and forming it into a compact bundle ready for use.

First, a thin piece of paper is forced down over two sets of pointed pins on the jig, the pins of each set being spaced .0300 in. apart.

The leads to which both ends of the wire will be attached are fastened down by means of spring brass clips. Outer end of the leads are attached to terminals at the end of the assembly board, these leads being connected to a Wheatstone bridge.

Now the operator draws the wire from its spool around a small wire guide post, hooks it around the terminal of the nearer lead, winds it back and forth around the pins, hooks it to the opposite lead and fastens the end to a vertical spring on the opposite side of the board. Solder acid is applied to the hooks, and a good, flat soldered joint is thus neatly obtained.

After cutting the wires leading to the spool and spring, the operator quickly squeezes out a small amount of cement over the wires, spreading it evenly to effect a sure bond between the wires and the paper. Care must be taken to use only enough cement, else the wires may "float" out of line.

Next, two pieces of the thin paper are spread over the rubber-surfaced top of the jig, which is forced into place over the wires. The lower paper becomes cemented to the wires and bottom-most paper to form the celstrain, while the upper one serves to protect the rubber from the wire.

A block one-half inch thick is brought into place against the jig top, and the whole is screwed tight. This block aids in providing added pressure and facilitates clamping. The wires now are released from their terminals and clips and bolts loosened, and the assembly transferred to a drier, where for 35 minutes it "cooks" at moderate temperature. At the

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It hunts the darkened battle skies . . . this deadly new U.S. prowler. It is the Northrop P-61 Night Fighter. The "Black Widow". The largest and most powerful pursuit airplane ever built.

Designed by the Northrop group in cooperation with the Army Air Forces Matériel Command, the formidable "Black Widow" is built to knock the enemy out of the skies by night . . . wherever he may be.

First plane to be developed specifically for night fighting, the "Black Widow" possesses great speed combined with easy flying characteristics. *It packs enough power to destroy anything that flies.*

In the months ahead, news will come back from the battle fronts about this newest U.S. weapon. The P-61 Night Fighter. The "Black Widow" of the dark skies.

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end of that time, the celstrain is removed.

Only two steps remain to ready the gauge for service. The paper must be cut to the desired width, and narrow strips of similar paper pasted over the tiny holes formed by penetration of the pins on the jig, this to prevent possible shorting when the gauge is brought in contact with a metal surface.

Though delicate and precise, this is no long-time job. An experienced girl assembler can turn out 60 or more celstrains in an eight-hour day. One expert Convair worker recently hit a top of 85 gauges in eight hours.

Now the device is complete, how does it function? In operation, an indicator measures the change in resistance of the wafer-thin celstrain gauge, which is made with one or one and one-half-millimeter diameter "Advance" wire with a one-inch gauge length and 50 ohms resistance. The gauge has been designed to indicate accurately the localized surface strain due to compressive or tensional loads applied as axial, shear, bending or torsional static loads in any metallic surface to which it can be cemented. The indicator has been calibrated to give stresses directly from the galvanometer deflections up to the yield of the material for 24S-T aluminum alloy and SAE X4130 steel.

The gauges can be quickly attached to any metal surface by using ordinary Duco household cement. In using this cement, the metal surface must first be thoroughly cleaned with acetone or some similar solvent. Removal of the gloss from a polished surface with a fine grade of emery cloth gives the cement a better purchase. A coat of the ordinary household cement thinned approximately 400 per cent with Duco thinner is brushed on the specimen and allowed to dry 10 minutes or more. A heavy coat of the Duco cement, as it comes from the tube, is spread on the underside of the gauge (the smooth side of the gauge with the paper strips cemented over the holes). This side of the gauge then is pressed into place, carefully orientated parallel to the desired component of stress, and the cement "squeezed out" by means of a narrow spatula or a small roller. A fairly flexible six-inch scale can be used to advantage for this operation. Care is taken to avoid damaging the fine wires in the gauge. Since this cement sets rapidly, the gauge is cemented quickly, and not disturbed after this "squeezing-out" process. A narrow strip of commercial adhesive tape can be placed across the gauge to hold it in place while drying. The strip need not be removed while testing.

After the gauge has dried several minutes, it is examined to make sure the cement has spread uniformly, and that there are no air bubbles under the gauge. Usually the gauges are dried four hours or more before using. A fan or warm air blowing over the gauge materially reduces this drying time.

Proper attachment of the gauge is perhaps the most important and difficult part of the use of the celstrain equipment. Concentrated effort over a period of days or weeks, however, will usually enable a careful operator to do this rapidly and satisfactorily. The installation is much less critical if the gauges are to be used only in tension. In compression, any air bubble or looseness may let the gauge wires bend instead of compress.

Where the gauges are being used on members in compression or in such a way as to bend under load, it is necessary to place the gauges exactly opposite each other on both sides of the member. In this manner the additional stress in one gauge will compensate for the lessened stress in the other and the average between the two will be the actual tension or compression stress at the elastic center of the sheet.

As one interesting application, three celstrain gauges can be used in the form of a rosette to determine the principal or maximum stresses in members which are subjected to combined co-planer tensile and compressive strains. A common use of this rosette is the determination of the principal stresses caused by shear loading of sheet structures.

The celstrain rosette is formed by cementing three gauges so that the centerlines of the second and third gauges intersect at 45° and 90° with that of the first. A single rosette made of three celstrains manufactured as a unit may also be used, but they are not as practical as the three-gauge combination. The use of three individual 50 ohm celstrains for this purpose has been found to be an advantage over a single "three-leg rosette" as used by some aircraft companies since a "shorted" leg of the rosette may be easily replaced in our three-gauge system but a completely new rosette must be applied in the other system. When they are to be used on sheets which may be subjected to bending, it is advisable to put a duplicate rosette on the other side of the sheet, connecting the opposing pairs of gauges in series so as to reduce the effect of sheet bending.

Because the versatile celstrain gauges are paper thin and flexible they can be used also with the indicator units to measure the maximum torsional strains (from which the stresses may be determined) along the principal strain axes of a rod or tubing by cementing them at an angle of 45° degrees to the elements of the specimen. Since, within the proportional limit the strain is proportional to the torsional load, the strain indications of the gauges may be used to indicate the torque applied when the specimen is subject to pure torsional moment.

As an illustration, the "torque gauges" are installed on a specially constructed aileron control shaft which is linked into the aileron. In this installation the aileron control shaft, which transmits the control torque from the hydraulic cylinder to the aileron linkage, has a piece of aluminum alloy tubing spliced into it. This tubing is riveted to the control shaft at both ends so that the tubing carries a full torsional load.

Three of six calibrated 50-ohm gauges are cemented to the surface of the above aluminum tubing so as to make 45° with its elements; the other three are cemented at 90° with the first group, thus indicating strain opposite in sign to the first group. By connecting the two sets of gauges into adjacent sides of the bridge circuit, temperature and bending compensation may be obtained.

As the foregoing indicates, our work to date has involved use of these gauges largely in static testing. In the field of dynamic testing, they promise to yield equally important results. A complete report on this type of dynamic installation must wait upon further experimentation. END

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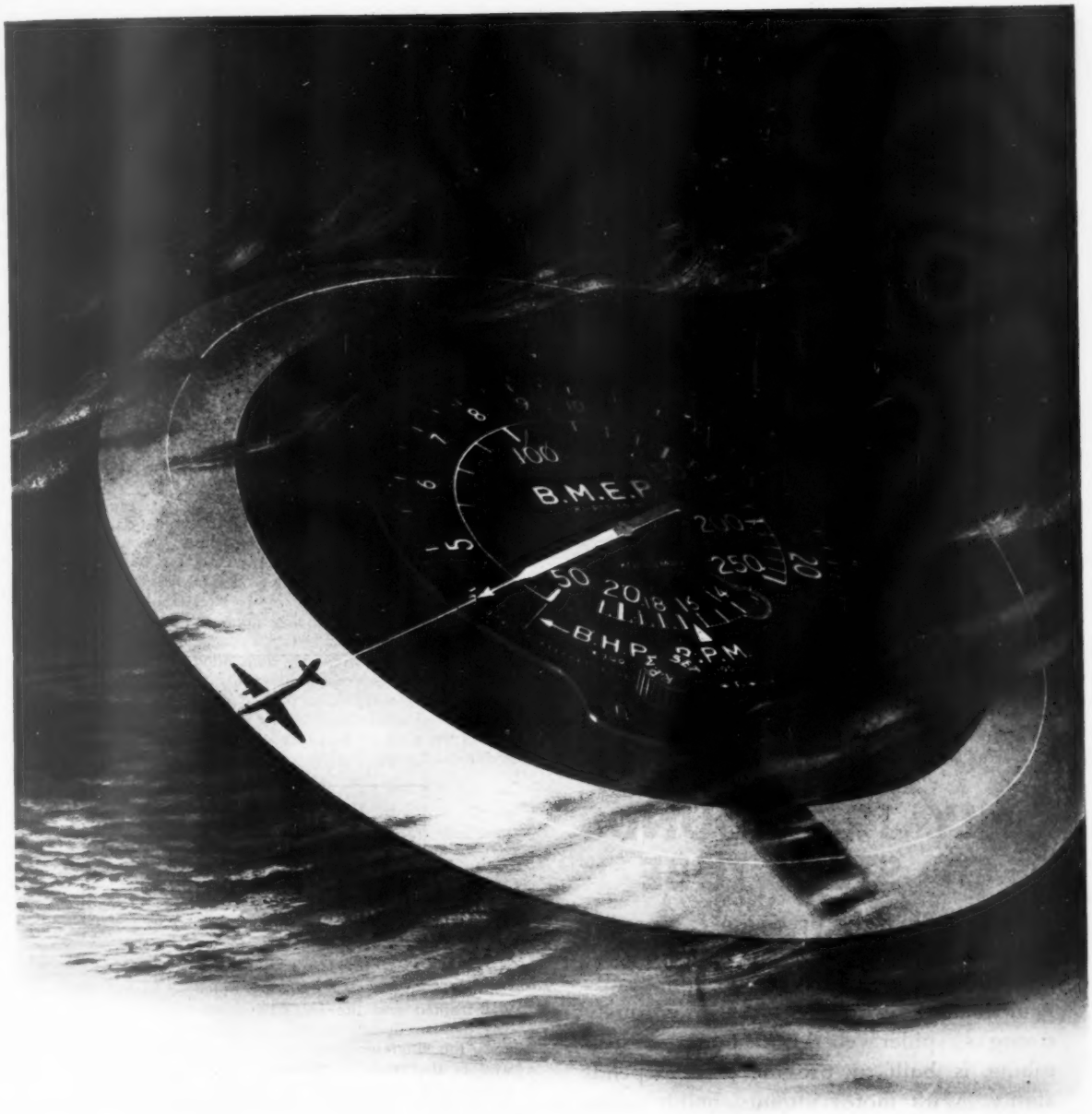

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Plane "Cannibals"

(*Continued from page 66*)

In the welding shop, for example, mechanics have gone out on expeditions to an abandoned copper mine, miles away in the hills, to strip it of metal parts—tubing, angle iron, I-beams and the like. With this booty plus the tail wheel of a salvaged Airacobra, they have made a little trailer, capable of being towed by the ubiquitous jeep, which carries the acetylene generator. This makes it possible to do welding on aircraft out on the field rather than having to disassemble the parts and bring them back to the tent-shop for work.

From the same sort of salvaged metal they have made small wagons and even a scraper to cut down the grassy growth around the revetments and dumps, thus eliminating fire hazards and making work easier.

Despite the most rugged field conditions, the squadron has rigged up a completely air-conditioned instrument shop, where the complicated nerve-centers of the aircraft can be given the most precise and painstaking overhauling. The shop is mobile and can be moved on a moment's notice. It is capable of handling the most intricate equipment, even to the delicate and complex bombsights. Boss of the shop is M/Sgt. Robert P. Fries, of Connellsville, Pa., who has not only set up the equipment regularly issued the shop but also has compounded two large and elaborate instrument testing boards out of parts and meters salvaged from wrecked airplanes.

At another part of the base the squadron runs a large parachute packing shop which at one time served the needs of the entire New Guinea area, drying and repacking each chute every 30 days—a necessity demanded by the humid climate. Under T/Sgt. Ewald J. Alderman, of Willis, Va., the department head, the shop has packed more than 15,000 chutes. It has handled as many as 1,600 a month. More than three-quarters of the packers had received no training in the work until Alderman taught them. END

☆ 15 YEARS AGO ☆

FROM the May, 1929, issue of this magazine:

Italy's military aviation was reported to be "efficient and well-trained and the equipment used is most modern." . . . The pioneer decade of carrying air mail was nearing a close and "the single-engined plane with open cockpits has given way to the tri-motored flying limousine, billowing with upholstered comfort." . . . The sound section of the Bureau of Standards developed a "virtually soundproof airplane cabin" by using an insulating material which also helped protect the cabin from heat and cold. . . .

The Travel-Air Company, Wichita, was offering two four-place cabin monoplanes powered with 170- and 225-h.p. engines, and three six-place monoplanes of higher horsepower. . . . German night flying airways were marked with lights at intervals of about 19 miles each consisting of a 1,500 to 3,000-watt bulb with parabolic mirror rotated by an electric motor. . . . Maj. C. C. Moseley, vice president of Western Air Express, Inc., wrote that while air passenger service had been successfully demonstrated, "air freight service has not been demonstrated—either here in the United States or in Europe—and it can be spoken of only in a futuristic way". . . .

Air transportation costs averaged about 10 to 15 cents per mile per passenger. . . . The cost of a tri-motored 12-passenger plane just about equalled that of a Pullman car but its maintenance cost far exceeded that of a locomotive. . . . The $80,000 passenger plane was given an average life of 2,000 hours over a period of two years and was depreciated at the rate of $40,000 annually. . . .

"In the past," declared an author, "we have thought too much of the airplane as an instrument of war. Now we have come to look upon it as a messenger of good will." . . . END

Last 10 seconds of a 1000 mile flight
No time in the flight of a huge transport plane is more important than the seconds-short landing period.
America's biggest planes are equipped with Aerols* to cushion landing shock and provide protection to plane, crew and cargo. Introduced when aviation was still in its infancy, Aerols are contributing substantially to aviation's progress—as planes grow in size, weight and speed, Aerols solve the landing problem for these aerial leviathans.
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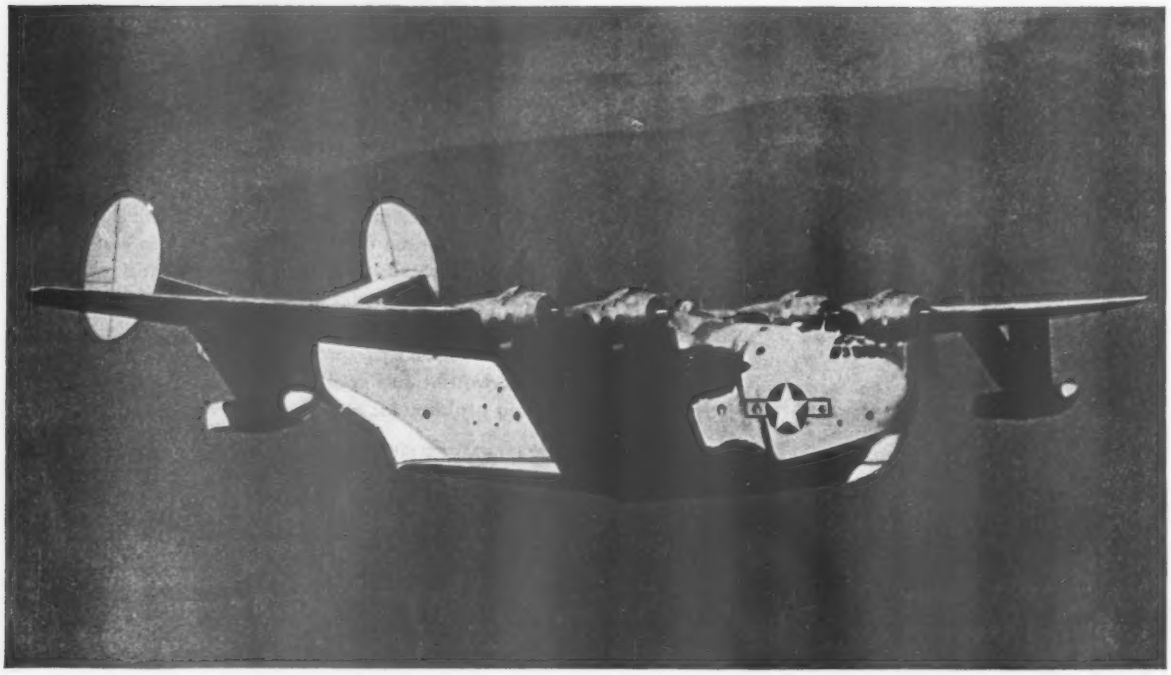
Blazing the Trail to Tomorrow with the MIGHTY MARTIN MARS!



The world knows, now, what the 75-ton Martin Mars can do. It's an established fact that she can transport 150 soldiers with full equipment . . . that she can carry 20 tons of cargo to the farthest spot on earth in 5 days or less . . . that she's the most efficient airplane yet built, per pound of material used, per horsepower and per gallon of fuel. Feats like her non-stop flight from Patuxent River, Md. to Natal, Brazil . . . 4,375 miles with a load of 16 persons and 13,000 pounds of mail . . . have proven the record-breaking characteristics of this giant flying boat. In regular service with the Navy, the Mars is shortening our long supply lines in the Pacific.

Multiply By Twenty-One!

Twenty sisterships of the Mars are now under construction for the U. S. Navy. This will mean that 3,150 men with full equipment can be rushed to distant battle-fronts in a matter of hours . . . that 840,000 pounds of vital supplies can reach the farthest spot on earth in 5 days or less! What overocean airline wouldn't "give its eye-teeth" for a fleet like that for postwar air travel?

Only A Beginning

Commercial versions of the Mars will offer every comfort, every luxury, to tomorrow's travellers. Yet even these giant airliners will be only a beginning. Martin engineers declare there is *no practical aerodynamic limit to the size of overocean aircraft.*

THE GLENN L. MARTIN COMPANY, BALTIMORE-3, MD.
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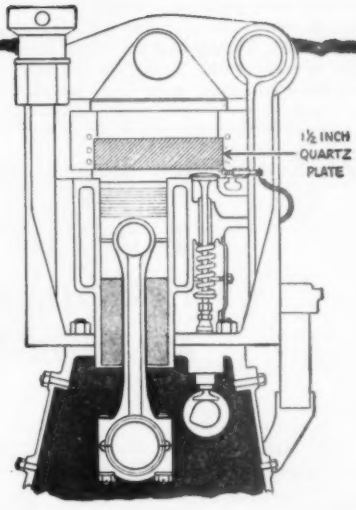
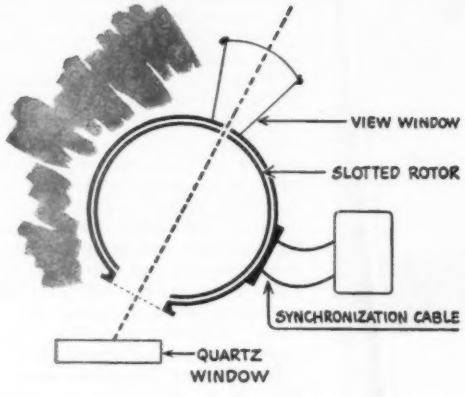
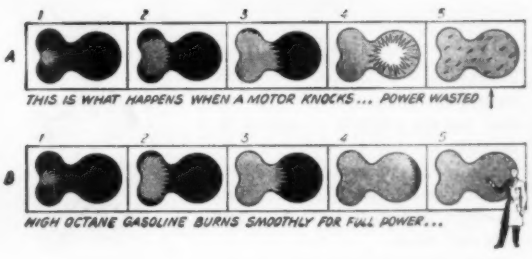
How we "freeze" flames to make hot airplanes



Aircraft engines run on flames from ignited gasoline. And how the flames burn determines how efficiently the engine performs. If the air-fuel mixture in the combustion chamber burns evenly and smoothly, far greater "push" is exerted on the cylinders than if it explodes quickly and sharply. Taming these explosions in high-compression engines is largely a matter of controlling the detonation characteristics of fuels. To see these new fuels in action, to learn how to improve them, Standard of California scientists developed this engine. It has a quartz plate in the cylinder head so that the actual combustion of test gasolines can be studied.



To "freeze" the flames, to apparently slow down the combustion process so that it can be studied, Standard scientists synchronized this stroboscope with the glass-topped engine. Through a slit in the stroboscope's whirling rotor one phase of the combustion process is viewed in successive explosions, giving the appearance of a continuous picture. Or it can be adjusted to follow the entire process like a slow-motion movie. Thus scientists can actually see how experimental fuels perform.



This is the biography of an explosion, what a Standard scientist sees through the stroboscope. Notice the violent explosion in frame A-4. This is knock, or detonation. Such violent explosions may dampen power, ruin engines. Equipment like the engine with the window in its head enables Standard scientists to improve aircraft fuels so that detonation can be avoided. With new Standard super fuels, flying combat teams get maximum speed and power from their motors—and designers can blueprint even more powerful and efficient engines for the sky giants of tomorrow.

STANDARD OF CALIFORNIA

Race Track Production Line

(*Continued from page 67*)

blankets its exterior, the throbbing and pounding of machinery have sent vibrant new life through the caverns within, where the devoted once paid homage at pari-mutuel windows.

But it wasn't smooth sailing in the early days of this still-expanding factory.

Bringing together the key personnel was a matter of convincing certain individuals, who perchance lived near the track, to come out of retirement.

Fortunately Crosby had his friend Fred Poggi to start with. Poggi, an amiable, slight-statured man who had been a gentleman farmer for 17 years, was peacefully attending to affairs on his Sorrento stock farm, four miles from the track, when Bing approached him.

"We've decided to build plane parts at the track," Crosby said, "and it's going to be your baby to manage."

Poggi, now 50, had been concerned primarily with raising cattle and horses on his farm for so long that Crosby's choice may have seemed questionable.

But before Poggi had settled down to the comparatively quiet existence of a country squire at the age of 33, he had lived through a rather hectic period as a mechanical engineer. After being graduated from Cornell in 1911, he traveled through the Orient, Europe, and Latin America, establishing factories, mills and distilleries. He had a financial and engineering interest in various mechanical devices and had been president of a dehydrator company in San Francisco.

Sandwiched into his career as an engineer was service in World War I, when, as a junior grade lieutenant, he was gunnery and pay officer abroad the troopship *Leviathan* on 44 crossings.

Crosby's offer came when Poggi was seeking a way of getting into World War II. A uniform might have had more glamor, but the intriguing prospect of running an aircraft parts plant seemed more practical. Poggi found himself back in a turbulent activity of the type he had put behind almost two decades before.

Poggi's scouting for a master mechanic at a time when there were none in circulation led him to the resort community of La Jolla, just south of Del Mar, to the residence of J. C. Kubic.

Ten years ago Kubic had closed his ornamental iron shop in Hollywood after gaining a reputation as one of the most skilled men in his trade. He went ranching near Palm Springs and for the past two years had escaped worldly cares at La Jolla.

Kubic grouses plenty today. He's back in work clothes, beneath the Del Mar Turf Club's grandstand and next to the pari-mutuel windows, amid the turret lathes, punch and drill presses, surface grinders, shears, milling machines, shapers, spot welders, drophammers and other apparatus of a completely equipped machine shop.

"I was enjoying life," he remarks wryly, "until Fred brought me into this."

But it's a false front, and Kubic, who like Poggi went back into harness at the age of 50, obviously is once more at home with the machinery a mechanic never ceases to love.

Small contracts — from Consolidated Vultee, Solar and Ryan in San Diego — were obtained and operations began last July. Floors of the *Liberator* pilot compartments were produced for Convair, while exhaust manifold parts were turned out for Solar and Ryan.

By the time these jobs were finished, Poggi knew that conversion of the plant for major sub-assemblies was not visionary. But when he set out to get orders he was confronted with scepticism by prime contractors. They reasoned that the Del Mar operation, so far off the beaten path and in a sparsely populated area of small farms, could not marshal enough labor to execute a large contract.

"For weeks I tried to convince one manufacturer, in particular, that the labor was there and that we could get it whenever necessary," Poggi said.

Almost in desperation, he went to Douglas, where he was interviewed by J. G. Jamison, in charge of outside manufacturing.

"When I explained our layout, Jamison immediately sat up and took notice."

(*Continued on page 142*)

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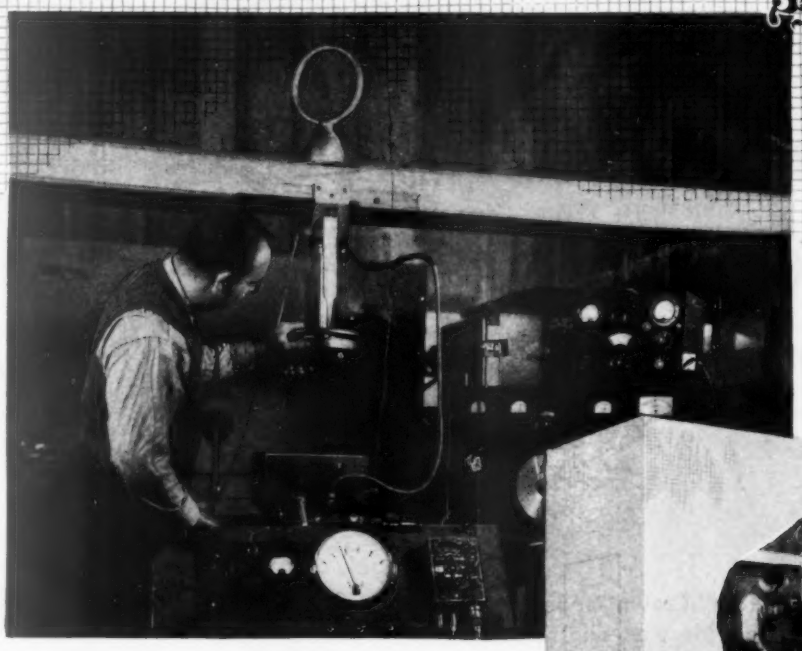
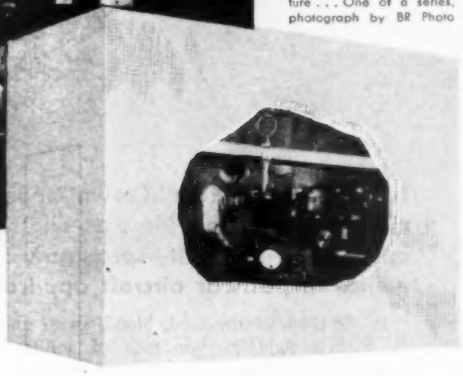
Keeping out the "Bugs"



Behind the scenes in Precision Aircraft Radio Manufacture . . . One of a series, photograph by BR Photo



IN a Zone of Electronic Silence known as the Screen Room, this radio engineer measures the directional characteristics of a Bendix* Aircraft Radio Compass—completely surrounded by double walls of bronze mesh, soldered and grounded to keep out all electronic interference. No electronic "bugs" can creep in to disturb the test readings during these meticulous and intricate adjustments . . . for on their accuracy a pilot's life may one day depend.

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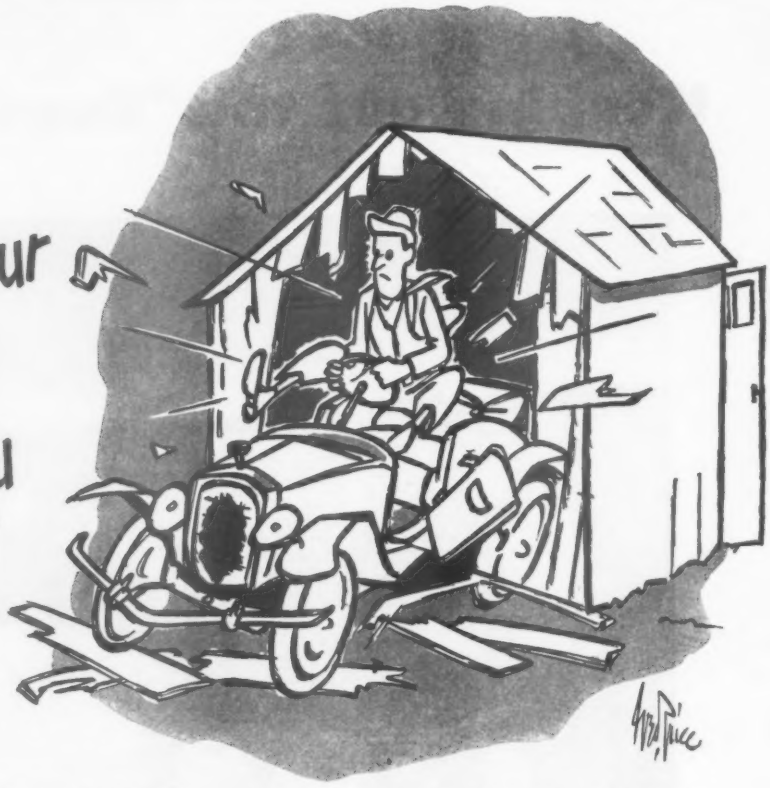

New "double-acting" Crown Zipper permits two or more sliders on one track—opens at given point—spells new convenience in postwar aircraft applications!

In the thick of the mud, blood, sweat and strain of today's fighting, hundreds of military items equipped with Crown Zippers are proving zippers can be big and tough yet amazingly easy to operate, small and dainty yet virtually indestructible!

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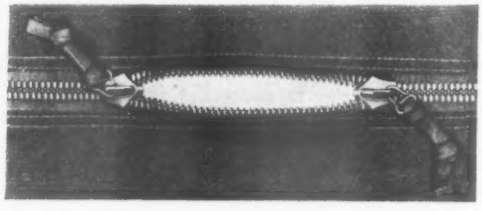

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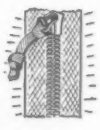
3. Provides opening wherever you want it

4. Won't lock open



5. Resists corrosion

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ONAN ELECTRIC PLANTS — Your inquiry for present or post war needs invited

D. W. ONAN & SONS
547 Royalston Ave. Minneapolis, Minn.

(*Continued from page* 138)

Poggi recalled. "He put on his hat and went down to Del Mar with me to satisfy himself that what we said about the floor space and available labor was true."

Jamison apparently was speedily convinced, because in three days a large order for wing assemblies was forthcoming.

Recruiting of labor in that seemingly remote hinterland was one of the easiest of Poggi's tasks.

"I had lived in Sorrento long enough to realize that there was plenty of labor among the wives and daughters of farmers and business men in the small communities around the track," he said.

"Many of the women who came to work for us were neighbors (anybody 15 or 20 miles away is considered a neighbor) whom I had known for years.

"But we didn't have to depend on them alone. During the last couple of years, hundreds of women have come to small towns in Southern California to live near their husbands, on duty in adjoining Army camps. They were delighted to find work so close to their homes.

"The women on whom we relied would not have gone as far as San Diego for jobs in the aircraft industry because, in most instances, they did not absolutely need the money.

"It was not a matter of tapping a labor market that would have been available to other previously established plants.

"Our experience probably can be duplicated in rural areas all over the country, where there might be doubt today that enough labor exists to keep a subassembly factory open. In most cases, the women working for the Del Mar Turf Club would not be in the war effort at all today if not for our plant."

With hundreds employed today, Poggi actually has a waiting list from which to choose as the factory expands. Most of the women are permanent residents of nearby towns, and labor turnover, nemesis of war plants today, is held to a minimum.

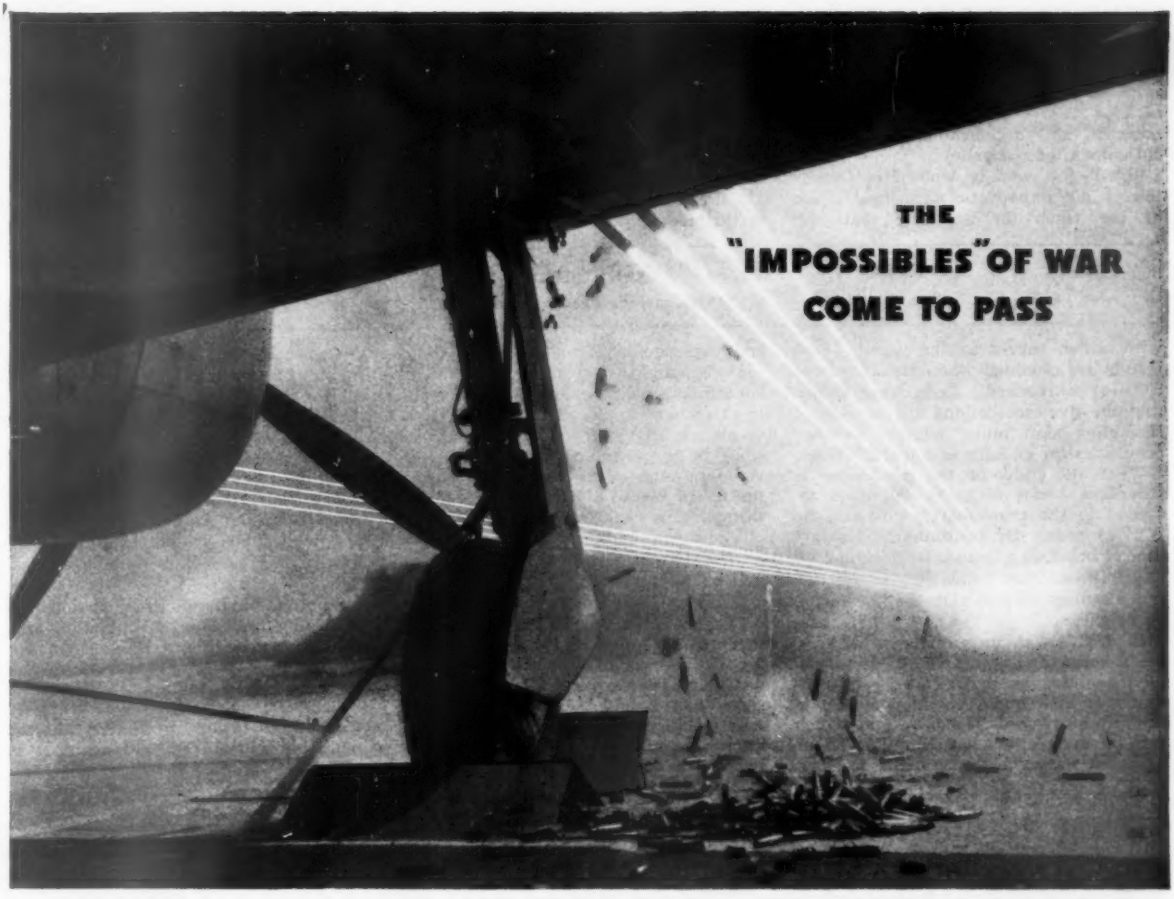
H. R. Proctor, liaison representative of Douglas at the Turf Club, points to the esprit de corps of the women, many of whom are on their first job, as one of the elements behind an excellent production record.

If pleasant surroundings are conducive to good work, the Turf Club has an immediate advantage. Lunch and rest periods are spent on beautifully landscaped grounds, where olive and palm trees and bougainvilla vines form a rustic setting to soften the grim aspect of a war project.

Women in slacks lounge around the picturesque fountain (now dry) or the paddock, where entries were paraded before races, or on spacious lawns. The Turf Club grounds have the general appearance of a park.

Often a rumor crops up that Crosby

FLYING "That new high octane gas is sure powerful stuff!"



"WE must some day be able to see enemy targets through the thickest fog and the blackest night . . . a single American soldier must be made a match for an enemy tank . . . we must be able to land armies upon every kind of fortified coast . . . we must send fighter planes seven miles into the sky, if need be, to smash enemy bombers from above . . ."

Thus read the notebooks of military strategy, not so long ago, listing things of war that were out of this world . . . the "impossibles" of the peacetime Sunday supplements.

But war is a relentless taskmaster. And so today we have a parade of "impossibles" of amazing variety—radar, the bazooka, unique troop landing craft . . . and an airplane that fights seven miles up, dives at speeds approaching the speed of sound, spits out more than ten pounds of steel projectile per second!

That airplane is the Thunderbolt — the joint product of an A.A.F. Matériel Command that knew what it wanted . . . and a corps of Republic engineers who knew it could be done. It is out of many such combinations that this nation is becoming invincibly armed . . . and its aerial supremacy made secure for the future.

Not the least "impossible" aspect of the Thunderbolt was its *production*. How could so intricate and elaborate a machine ever reach "quantity production"?

Yet, in a recent month, more planes came off the Republic Thunderbolt assembly lines than came from the assembly lines of any other company in America producing fighter-type aircraft.

Republic, along with every other war material manufacturer, working hand in hand with the Army Air Forces, is ready for still more "impossibles." Republic Aviation Corporation, Farmingdale, L. I., New York, and Evansville, Indiana.

Republic *firsts* in war point to *firsts* in peace

Thunderbolt

REPUBLIC AVIATION
CORPORATION

Specialists in High-speed, High-altitude Aircraft

FARMINGDALE DIVISION

Write that boy today — V-Mail

plans to apply again for racing dates. These are promptly scotched by Miss Marge Willett, Poggi's secretary, who has been with the track ever since it was built, stayed on when the aircraft division was formed, and probably knows more of the organization's inner machinations than anyone.

"Until the war is won, Mr. Crosby thinks it's unpatriotic to consider use of the track for anything that will not help the war effort," she remarks.

"He has repeatedly said that the plant has been dedicated to a war purpose and that it will be kept that way until victory."

After Bing and others made the initial investment of $200,000 to open the aircraft division, Poggi was given his instructions regarding profits.

"Bing told me he'd be satisfied if we could meet expenses of maintaining the track in condition good enough so it can quickly be restored to its original use after the war," Poggi asserted.

Meanwhile, the biggest race ever run at Del Mar is well under way—a race against America's enemies.

And Crosby—often tormented because a horse on which he has put much faith and lots of money winds up an also-ran—knows he's got a sure-fire winning entry today. END

'Gibson Girl'

(*Continued from page* 58)

wire which serves as the aerial. Best results are obtained when an altitude of 300 feet is reached. Tests have shown that the five-foot ballons are capable of remaining aloft under adverse weather conditions for as long as a week.

When the crank on the transmitter is turned, a series of gears and discs attached to the crankshaft spells out the SOS in code. By continuous operation the set becomes a transmitting station on which pilots can tune their automatic radio compasses and ride the "beam" to its origin.

In addition to its automatic features, the "Gibson Girl" can be operated manually, enabling an experienced radio operator to send messages in code. It is also equipped with a signal light which can be used either for illumination or operated as a "blinker" light to send code messages.

Designed to operate under difficult conditions, this small set has meant life to many an airman. It is a close friend to all who fly. Now, for the first time, some of the extraordinary and unusual rescues, outside the routine of picking up flyers forced down at sea, effected through this radio can be told here. An official memorandum declares:

"The 'Gibson Girl' and the yellow lifebelt called the 'Mae West' are becoming a celebrated lifesaving pair.

"The SCR-578 originally was intended for use in aircraft making extended flights over water. But it has proved its worth in aircraft making long hops over sandy wastes and tangled forests and is now installed on all Army planes flying great distances over water, desert and jungle.

"All occupants of an Army aircraft making such a flight are carefully briefed on the location of the 'Gibson Girl' in the ship's emergency equipment and how to use it.

"The transmitter is rugged. It has functioned after being dropped into the water from great heights. It has withstood corrosion, salt water and sudden, drastic changes in temperature. It has shown itself extremely reliable in operation."

So much for the mechanical side of the "Gibson Girl." For its operation under emergency conditions let us compose a story typical of many reports received from airmen on the battle fronts.

"Our *Flying Fortress* was badly hit. We had outrun enemy fighters but were rapidly losing our formation and it was

(*Continued on page* 148)

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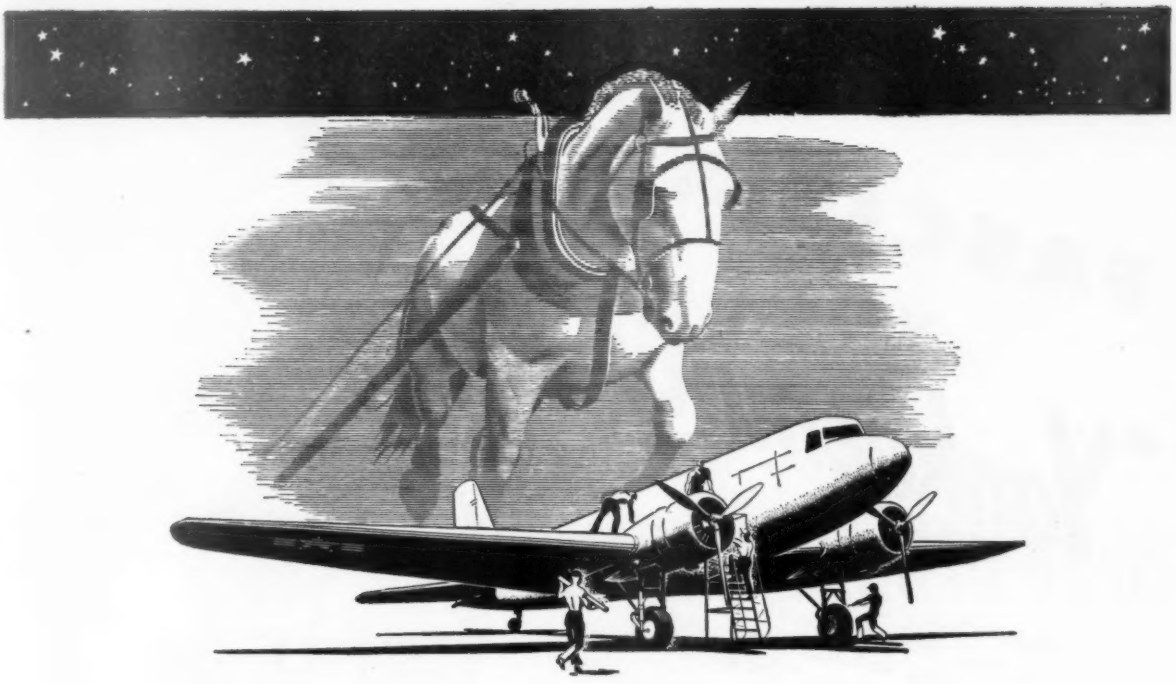

CARE OF A WORK HORSE

Outwardly appearing like its former self but inwardly stripped of peacetime luxuries—the DC-3, in war garb as the C-47 Skytrain, has rightly become known the world over as "the Work Horse of World War II".

Precious cargo from troops in transport to food supplies, guns, munitions, dismantled jeeps, trucks, and tanks as well as "wings of mercy" for the wounded are a few of the varied and numerous tasks delegated the Douglas C-47.

To assure greater operating efficiency for rigorous tasks under all conditions, proper maintenance of the work horse is all-essential—whether on homefronts under favorable conditions or on battlescarred landing fields. And so the proper "care of a work horse" that's won its laurels in this global war, is a "first" with ground crews everywhere.

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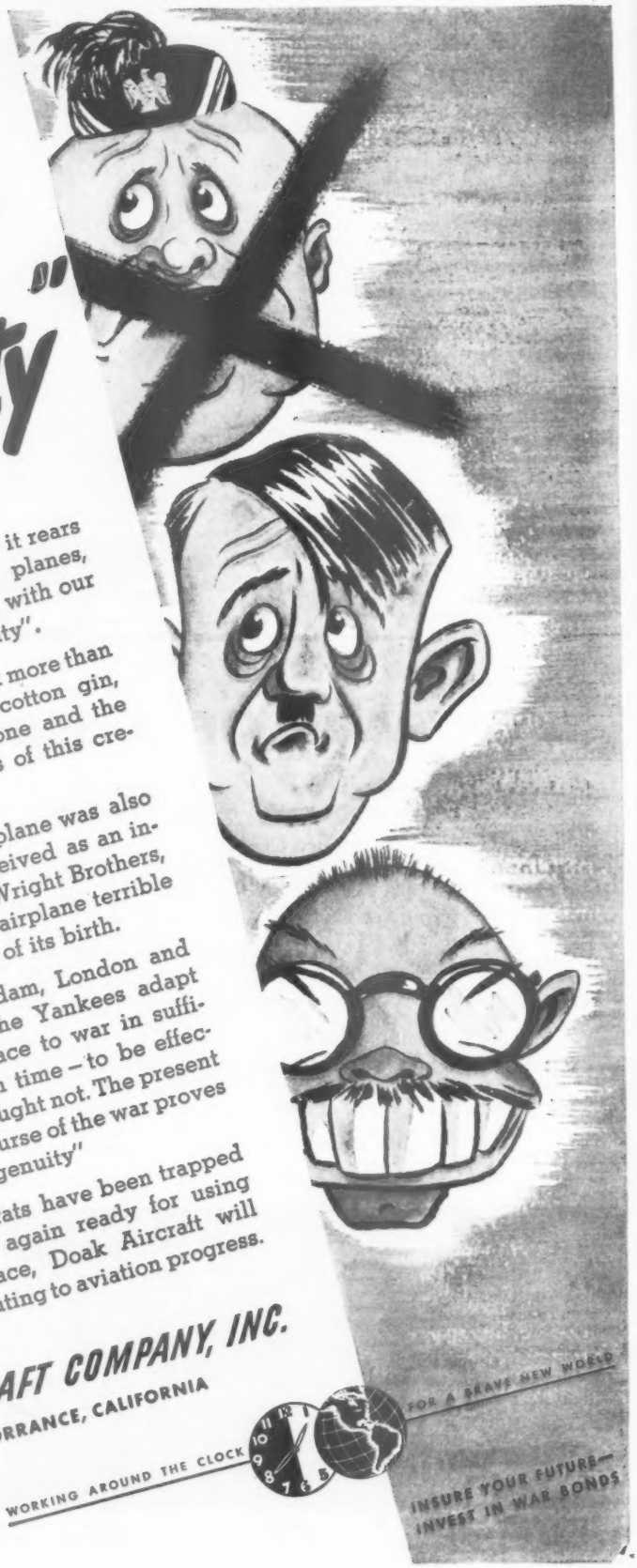
FASCISM vs. "Yankgenuity"



We are fighting Fascism wherever it rears its ugly head — fighting it with planes, tanks, guns and free men — and with our exclusive weapon — "Yankgenuity".

Yank (ee in) genuity dates back more than 150 years. Invention of the cotton gin, steamboat, telegraph, telephone and the automobile are fair examples of this creative genius.

Invention of a practical airplane was also a Yankee first. While conceived as an instrument of peace by the Wright Brothers, Fascists soon saw in the airplane terrible implications for the land of its birth.

And so Poland, Rotterdam, London and Pearl Harbor! Could the Yankees adapt their instrument of peace to war in sufficient volume — and on time — to be effective? The Fascists thought not. The present and certain future course of the war proves the power of "Yankgenuity"

When the Fascist rats have been trapped and the world is again ready for using airplanes for peace, Doak Aircraft will continue contributing to aviation progress.

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TORRANCE, CALIFORNIA

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FOR A BRAVE NEW WORLD

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INVEST IN WAR BONDS

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YOU'VE heard what the experts and prophets are saying about tomorrow's peacetime planes. And now it's *your* turn to speak up!

Right now, at the Bellanca plants, day and night, we're building the twin-engined AT-21-BL crew trainer, together with vital Army Air Forces warplanes armament and components. But we're thinking about *your* post-war plane, too — and it's none too early for *you* to do some planning.

To get the views of future aircraft owners, we're circulating an interesting and useful Aircraft Quiz. The landing-gear question stated above is one of the many appearing on this Quiz. Other Quiz features ask the number of engines you prefer?—how many seats?—what speeds and range?—what size and type of engine?—how will your plane be operated?—whether you place Speed, Economy, Safety or some other outstanding characteristic *first*?—and many other questions bearing on the size and kind of aircraft you will want after our enemies are defeated...after you and yours have returned to the American way of life and liberty.

Thousands are asking us for copies of this provocative post-war Aircraft Quiz. Shall we send it to you? It's arranged simply, so you can check off the answers in a few minutes. Then you can compare *your* answers with those of many other aviation enthusiasts who are now making their plans for peacetime flying. Just send your name and address to us—you'll receive the Aircraft Quiz by return mail.... Bellanca Aircraft Corporation, Dept. S-1, New Castle, Delaware.

Keep on Buying U. S. WAR BONDS

BELLANCA

(*Continued from page* 144)

pretty evident that we were going to have to make a forced landing in the ocean.

"The pilot gave the order to abandon ship. At an altitude of about 500 feet we parachuted two buoyant bags of equipment, strapped together, and followed them over the side. The water was plenty rough. We pulled the trigger that automatically inflated our 'Mae West,' found our liferafts and automatically inflated them. A couple of the boys were badly shot up but we managed to pull them onto the rafts.

"The going was pretty bad, but we spotted our 'Gibson Girl' in short order. (The bags containing the equipment are painted a bright yellow. They hold the transmitter, a collapsible box kite, two deflated balloons, two hydrogen generators, a spare roll of aerial wire, a signal light and a book of instructions.)

"We got the aerial up in nothing flat. The raft was pitching so badly that it was necessary to use the webbing straps on the set to hold it in position between the operator's legs. He started to grind away while we shivered and prayed. It looked like a helluva small and impractical dingus to get us out of this mess.

"But it wasn't so awfully long—although it seemed like two or three lifetimes—before a destroyer showed up on the horizon heading directly for us. 'Sparks' kept on cranking like crazy, switching to code and telling the ship our wounded were in bad shape and needed help quickly. The destroyer was soon alongside, picking us up. All of us will live to fight again."

Included in the memorandum released by the Air Transport Command are two case histories which are characteristic of an increasing number filed away in Washington.

"During the spring of 1943, a U.S. Army bomber bound for the Middle East theater of operations was forced down in the African desert by mechanical trouble. The bomber was damaged badly but its crew escaped serious injury. They hoisted the antenna of their 'Gibson Girl' by balloon and radioed for help. They had come down along a well-traveled airway and their SOS was soon picked up by a plane which got a fix on the location of the flyers. The plane radioed this information to the nearest air base which immediately dispatched a flyer to drop water, food and medicines and started a rescue party to the scene. Three days later all members of the disabled bomber's crew had been rescued."

The second example had its locale some place in the South Atlantic between the bulge of Brazil and the West African air base.

"This summer an Air Transport Command plane flying the South Atlantic spotted a half dozen survivors of a United Nations steamship floating on a wooden raft. The plane dropped a liferaft, provisioned with food, water, medicines, fishing tackle, and a 'Gibson Girl' to the castaways. The mariners used the 'Gibson Girl' to send out an SOS and direct their rescuers to them. They were picked up within a short time by a surface vessel. This is believed to be one of the first times that a plane has effected the rescue of survivors of a surface vessel by dropping the SCR-578 into the sea near them.

"The 'Gibson Girl' has figured in the rescue of flyers from jungle areas of South America, from the Greenland icecap, from North Atlantic waters and from many areas in the Pacific," the Air Transport Command relates. "During the fall of 1942, the crews of two downed planes on the Greenland icecap maintained radio communication for several weeks with planes overhead and nearby air bases by means of the 'Gibson Girls.' Survivors of both plane crashes eventually were rescued."

The story behind the development and production of the "Gibson Girl" is almost as amazing as the device itself. It was born shortly before Pearl Harbor when the British Air Ministry expressed an interest in an emergency radio transmitter of rough, German design, taken from a liferaft found floating on the Atlantic.

A small group of American manufacturers were permitted to make a hasty study of the set. Representing Bendix was Bert Hemingway, director of the radio sales division.

On information sent to the North Hollywood Bendix radio laboratory by telephone and airmail from Washington, D. C., a working model was developed and submitted to the British Air Commission within a ten-day period. This was the set later destined to become the "Gibson Girl."

Invocation of the lend-lease program brought Bendix into close collaboration with the Army Signal Corps, which made engineering contributions to the set through its aircraft radio laboratory at Wright Field.

A triple engineering job, calling for ingenuity in the fields of radio, mechanics and chemistry, was involved in perfecting the "Gibson Girl." Developing an efficient radio circuit was only one of many problems successfully faced.

Devised among other things were a lightweight, watertight transmitter case; a satisfactory generator for chemically producing hydrogen under the most adverse conditions: a powerful, yet compact electrical generator and a collapsible kite.

An interesting outgrowth of the "Gibson Girl's" development and use is the formation of the "Order of Gibson Girls." To qualify for membership in this organization, military personnel must have been rescued through the use of this radio. END

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OFFICIAL PHOTOGRAPH, U.S. NAVY

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It is about the world's worst place to run out of gas—that Pacific ocean—but Navy Fliers waste little time wondering where they are. The Dalton Aircraft Navigational Plotting Board (MARK 3 A) . . . the Dalton Dead Reckoning Computer (TYPE E6B) and the new Aircraft Navigational Plotter have taken care of that. These are the three basic instruments precision made in Felsenthal Plastics that take the Navy to the fight . . . and back!

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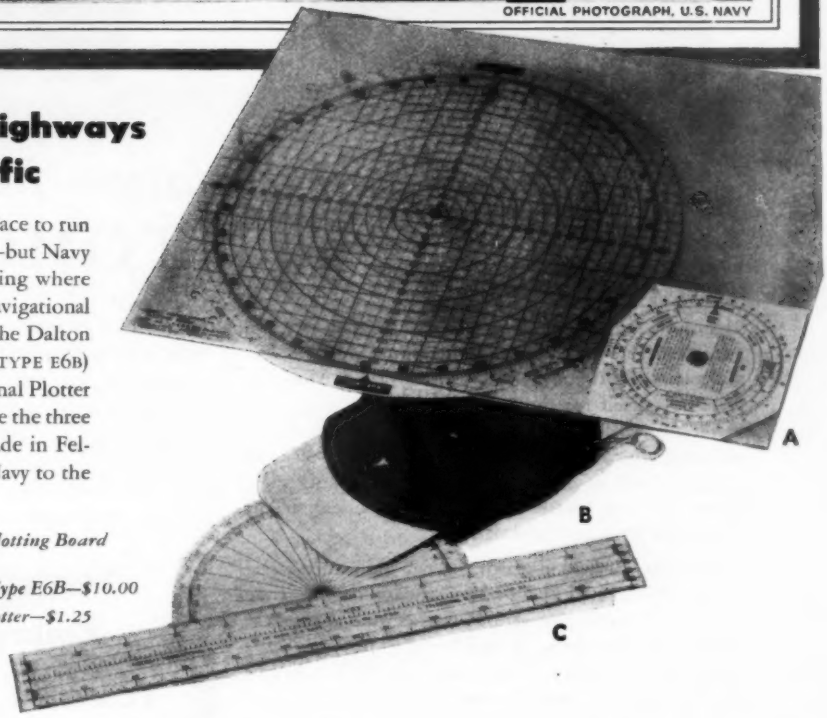

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City..... State.....

The Air Must Be Free

(*Continued from page 51*)

territories—whether mandated as a result of the Versailles Treaty or as a result of treaties growing out of the present war—should be free for United Nations planes. if not the planes of all the world.

Other widespread free areas seem to be in order in those countries now occupied by the enemy. They should be willing to allow freedom of the air to much of their territory in return for the freedom which will be given them as a result of the Allied war effort. Air over land taken from the enemy countries and restored to their former owners also should be in this category. For example, if out of this war a nation like China has restored to her an island such as Formosa, it would seem only logical that she grant air freedom to the world so far as Formosa is concerned.

The world pattern of such a program takes significant form. Mark off a globe with all the free areas I have suggested. all of which can be brought about as a result of the war and without doing an injustice to anyone, and you will find that the problem of free air can be solved for most of the world. You will have free air over the seas and other important bodies of water and rivers, free air over the poles, and free-air cities or islands at close enough intervals across the continents of the world to be within easy hopping distance for the average transport of today or even the below-average transport of tomorrow.

Nor will those nations which want nationalistic control and absolute jurisdiction be left out in the cold. They will have gained their two major objectives: freedom for their planes anywhere they want to fly in the world, plus jurisdiction for themselves over their own territory.

Or put it in terms of the United States only When one realizes the extent of the earth which we ourselves will insist upon having left open to us—even if air control is recognized as being nationalistic and air jurisdiction over a given land as it is today—it is clear that our interests are so extensive that we must keep in mind both the national and the international aspects of the whole question.

Consider one example among possible thousands. Assume that the present international law of the air prevails; that strictly internationalistic selfish ideas control; that every nation keeps absolute control over the air above its territory—but wants access to all other territory excepting over similar nationalistic jurisdictions. If these rules prevailed the United States would need free air between the State of Washington and Alaska, even though it be over Canada. We need free air over anything which is in the way between continental United States and the Philippines. And so on around the world.

All types of air transport, in a peacetime world, may benefit from such an arrangement. Transports can link the world markets. Lighter-than-air ships, aided by world control of helium now held by Russia and the United States, should stage a dramatic come-back. Private planes can operate without fear of changing international regulations.

In summary, we must not, in the international conferences to come, give only lip service to what the British so appropriately spell in capital letters. This "Freedom of the Air" should become more than a phrase. It should become an international slogan, the basis for a program. It should be given meaning in terms of concrete proposals. Countries, cities, territories, islands and areas should be named. Mileages should be measured, concessions drawn up by all the nations participating. Only by such a practical, realistic approach can we expect to get anywhere at all.

With proper f o r e s i g h t, with careful planning, such a program can by the same token lead to a foundation, built by the United Nations, upon which will arise a permanent and workable peace. END

Letters

(*Continued from page 86*)

started teaching the new "Full Panel Instrument Flying," with great success.

If you will investigate this matter more thoroughly you will find that their manuals were taken verbatim from Navy manuals. Also, the first Army full-panel attitude instrument instructors took their basic instrument training at Naval Air Station, Atlanta. Ga.. some ten months ago.

L. R. SIMPSON
First Lieut., USMCR
Instrument flight instructor
Whiting Field, Fla.

INTRUDER, INVADER, APACHE?

SIRS:

There is a plane in the news that has me guessing. I know that the A-36 *Invader* is the dive-bomber version of the *Apache*, but the British "Intruder" I don't know. I know it's not a new plane, just a new name for an old-timer, yet it's a good plane. I've seen a photo of this warplane with the name "Intruder" under it only once in any airplane magazine but I've forgotten the ship. . . . The "Intruder" is still a mystery to many readers. . .

JOE A. BLIGH
Atlantic City, N. J.

● Most of the confusion is due to inaccurate, incomplete reports from Sicily (where the so-called *Invader* first saw action) and in the aviation press in this country. The airplane in question is simply the North American *Mustang*. The *Mustang* is used by the AAF in two versions: the P-51 fighter and the A-36 attack-fighter. Officially, both versions are known only as the *Mustang*. After the A-36 version went into action in Sicily, however, U. S. Army airmen dubbed it *Invader* because of its efficacy in strafing and bombing advance enemy installations. This nickname has even been used in Army reports, although it has been given no official recognition. The name *Apache* never was official either; it was chosen by the manufacturer, but the RAF and AAF officially adopted the name *Mustang*. To our knowledge there is no airplane in the Allied air forces known as the *Intruder*. Many current fighters (particularly in the RAF, where the term has been applied to the work of *Hurricanes, Mosquitoes, Typhoons* and *Mustangs*) fly on what are known as "intruder operations".—ED

EXCHANGE WANTED

SIRS:

I have tried to get your magazine regularly but was told that I could not obtain it directly owing to money restrictions. . . Is someone prepared to swap his copy of FLYING for copies of The Aeroplane, one of our leading weeklies . .?

C. A. E. OSMAN
Bulls Green Farm
Datchworth, Knebworth
Herts, England

● Other British readers who would like to exchange aviation publications for copies of FLYING include Leonard Bomphray, 14 Gurney Street, Middlesborough, Yorkshire; Cadet P. Gaze, ATC, 12 Byland Ave., Huntington Road, York, Yorkshire; and an unnamed correspondent at 19 Berbetts Road, Eltham, London, S.E.9. —ED.

PRAISES FERRYING DIVISION

SIRS:

In a recent issue of FLYING I read Paul Dillon's article, "Ferry Godfathers". It's nice to know that there is one base for the ferry pilots where their health and the condition of their plane is stressed.

I *had* a very dear friend with this organization. . . . He lost his life trying to save a plane that he had just gotten from a factory.

A buddy of this pilot told me that two other ferry pilots crashed that day in planes from this same factory. . . . It's time for someone to start shouting the praises of the Ferrying Division of the Air Transport Command.

ISABELLA B. WILSON
Spartanburg, S. C.

STUDENTS WANTED

SIRS:

I am very anxious to get in touch with some of my former students. I am writing this to you in hope that some will see it.

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Report from Washington

(*Continued from page 68*)

reached the persistent rumor stage in Washington is removal of the ban on private flying along the east and west coasts. No move, official or unofficial, has been made as we go to press, but rumors that the bans will soon be lifted, at least enough to permit civilian pilot training in the restricted areas, have been cropping up almost daily, according to Earl Ward, chairman of the Interdepartmental Air Traffic Control Board.

When action is taken, the Board will implement it. But it cannot move without approval from the commanding officers in the areas in question.

Photogrammetry

Photogrammetry—the science of measuring and mapping with photos, particularly aerial photos—is one of the many things that has grown by leaps and bounds since the war started and will appear in a dramatic world role the minute peace returns. The least that its advocates expect to do is make a photographic contour map of the world. Question them—and you will find that this is not a week-end chore, since of the 56,000,000 square miles of land area in the world, some 40,000,000 are either unmapped or badly charted. But the photogrammetrists are unawed. They point out that such information will be of unlimited value to peacetime progress and will offer innumerable adventurous flying jobs for those who are interested.

The boom is already on, especially in this country. The Federal Government, after working more than 50 years compiling topographical quadrangle maps, covered only about one-third of the nation. We entered the war with the greatest proportion of unmapped land among the more advanced industrial nations. Expansion in photogrammetric activities followed. One Federal official estimates that today more than 2,000 civilians are working on photographic map compilations, with as many—or more—busy at the same type of work in the armed services. Fairchild Camera and Instrument Corp., which formerly built equipment in dozen lots, now is turning out units by the thousands. Result is that there is enough equipment now on hand, according to the experts, to make detailed maps of the rest of the United States after 20 years of work, and at the same time work on special jobs elsewhere in the world. Particularly happy hunting grounds will be the jungle reaches of South America, and Polar regions.

Civilian applications of aerial photography are almost countless—measuring crop areas, solving traffic problems, determining the area of a flood, charting power lines, counting ranch herds, etc.

Briefings

Down this way a couple of good sources say that the reason why funds for the Kaiser-Hughes super-plane are being cancelled by the Federal Government is because the Martin *Mars* has done so well in its flight tests—and costs so much less. . . . A private who came into Washington National Airport the other day told such a convincing story about having to get money to pay for a plane ride to his mother's funeral in Detroit, that PCA ticket girls led by Lyn Weitzel raised $30 to speed him on his way. Apparently the funeral was a great success—a check paying off the debt came to Miss Weitzel a few days later—signed by the soldier's mother! . . .

Bug-eyed "Wash Tubbs", the comic strip star, recently earned the dubious honor of being reprimanded by none other than Gen. H. H. Arnold himself. The closely-guarded *Black Widow*—the Northrop P-61—appeared in the Tubbs column and the high-ranking reprimand followed. As red-eared as "Wash" were censorship officials here, who had reviewed the strip—and approved it. .

If training proves a bottleneck blocking early use of the jet propulsion plane on the fighting fronts, as was indicated here by a high British official recently, there is at least one big group of fighter experts who are not in the least worried. A spokesman for them, referring to the famous super-voltage *Lightning*, said recently: "She'll do every damn thing that the jet propulsion job will do." . . .

Seldom do we hear praise of the flying arms from men who are serving on land or sea, and even when it does come it's usually grudging. War Shipping Administration recently broke with tradition in this respect when they gave an official statement exclusively to FLYING. We quote: "Probably no element of a transatlantic voyage is more welcomed by American merchant seamen and Navy armed guard units aboard our ships than the regular appearance of off-shore patrol aircraft, based on American, Canadian and British shores, as well as on both sides of the Mediterranean.". . . . The Society of Automotive Engineers, which tried to move in on aviation engineering early in the war by preempting the duties of the National Aircraft Standards Committee of the Aeronautical Chamber of Commerce, now is reaching again. This time they propose to establish themselves in the aviation engineering field on the strength of the fact that "automotive" in SAE means anything that is self-propelled. Aero C of C officials regard the most recent SAE move to expand their activities with a tolerant smile. . . .

John E. Sommers, deputy administrator of the CAA, thinks training should be subordinated to salesmanship. He believes there will be plenty of pilots if new planes can be operated cheaply enough. . . . The jet propulsion mystery plane was over Washington the other night. There was a low ceiling and you couldn't see it but, sure enough, it sounds like a teakettle at high boil. . . . Incidentally, certain publications apparently are attempting to evade censorship by picturing an "artist's conception" of the revolutionary jet plane. . . . END

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But Kellett's expanding corps of engineers looks forward enthusiastically to peace, when current rotary wing accomplishments may contribute to the cutting of costs and saving of time in a wide field of usefulness, freed from limitations of airports, and from the usual speed-altitude requirements of aircraft.

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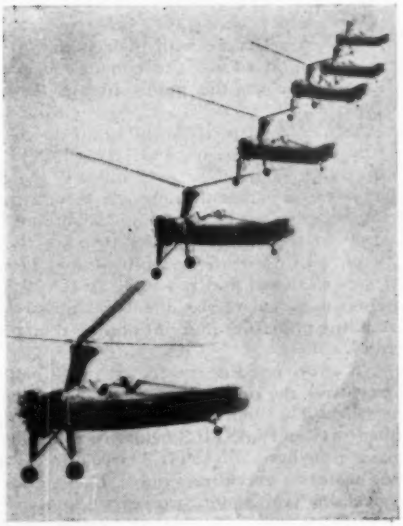

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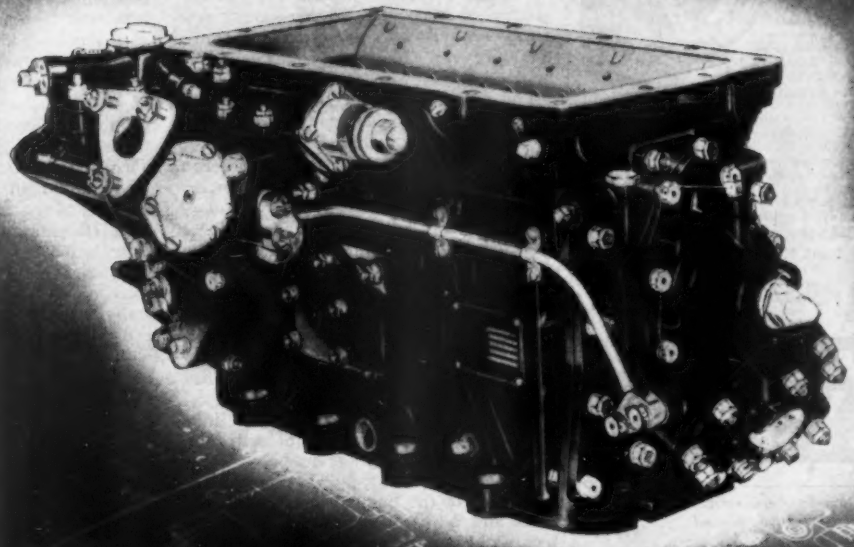

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Electronic Pilot

(*Continued from page 49*)

plane's heading by accelerating action of the rudder and aileron pickups. It then permits a gradual return to normal.

Using the turn control, the human pilot may make course corrections and even 360° turns without losing altitude. He also may bank up to 30°.

Current for the autopilot is supplied by the rotary inverter. The three servo motors get power from the aircraft's main supply. The motors move the controls to positions corresponding to that of the related gyro-operated wiper. They are locked in position until receiving new electric impulses. A three-part electronic amplifier (for ailerons, rudder and elevators) boosts the current.

Leveling the aircraft is done with a vertical flight gyro which causes the gyro case to turn when the plane pitches or rolls. This motion rotates the aileron control wiper, causing the servo motor to operate the ailerons or elevator.

Pilots can bring damaged planes home with the M-H autopilot because the servo motors are placed as close as possible to the controls they operate. There is relatively little chance of enemy shell fire damaging the small, flexible wiring between amplifier and servo motors, while mechanical controls from the cockpit are in constant danger.

A Norden engineer explains the linking of the Norden bombsight with the autopilot:

"When control of the airplane is in the hands of the bombardier, the corrections and adjustments he puts into his bombsight automatically change the directive forces flashed by the gyros to the power unit of the autopilot. Thus the bomber is flown automatically by the bombsight. . . . Changes are made instantly, with no lag such as human hesitation; there is no possibility of error due to the human equation."

Though it has limitations, such as inability to make violent evasive maneuvers and aerobatics, the M-H autopilot "can fly a plane with much more precision and accuracy than can a human pilot," according to Col. R. E. Jarman, chief of the bombardment branch of the Wright Field Armament Laboratory, which helped perfect the device.

For example, the normal human requires one-tenth of a second to react to an outside stimulus. A bomber flies 50 feet in that time. Hence that tenth of a second can result in the bomb missing its objective by many yards, if wind, antiaircraft fire or rough air throws the plane off course at the last second.

But the autopilot reacts so swiftly to outside disturbances that a recovery is made almost before the disturbance has moved the plane from its course. Its sensitive mechanisms take control when flight accuracy is of the utmost importance. The pilot might have 10 different things to do mechanically—all racing through his brain at the same time. He cannot do them all at once. But the electronic pilot can have 300 "thoughts" in its "mind" at a given instant and perform all of them within a minute.

Development of the device began under the direction of the Navy Department in 1935, with the C. L. Norden Company, builders of the Norden bombsight, making the first units. The Navy continued testing the device until 1938, when the Army took over the tests to adapt the pilot to its particular uses.

The first AAF plane to be equipped with the electronic pilot was the now obsolete Douglas *Bolo*. Convinced that precision bombing was to be the AAF strong point and that the automatic pilot (then known as Stabilized Bombing Approach Equipment—SBAE) was the means of assuring precision bombing, a group of Wright Field experts set to work to perfect the device. Besides Colonel Jarmon, these men included Brigadier General Carroll, chief of the engineering division of the Materiel Command; Capt. D. E. Hamilton and Col. D. N. Kilpatrick, later killed in a crash.

The old SBAE called for special equipment on each type of plane. While basically what the researchers wanted, improvements still were necessary. Meanwhile, a group of Minneapolis-Honeywell engineers demonstrated a new electronic circuit at Wright Field. The original circuit was of no value as an autopilot, nor was it intended to fly an airplane. But technicians at Wright Field saw its possibilities and asked the company to design an electronic system around the then-existing Norden autopilot.

Minneapolis-Honeywell men and Army officers tested the equipment in *Mitchells* and *Fortresses* during the spring and summer of 1941. Late in the summer of 1941, Colonel Jarmon and his assistants decided they had what they wanted. Jarmon and another officer flew a *Fortress* from Wright Field to Washington to demonstrate the development to high officers of the Army and Navy.

Both services approved and the autopilot was put into production in October, 1941. Almost immediately it was standardized and installed in AAF bombers. The first standardized autopilot was installed on a *Fortress* early in 1942. It has undergone many modifications and improvements since then and today it is standard equipment on all U. S. four-engined bombers and on some bomber-trainers.

Minneapolis-Honeywell first started by modifying the Norden-built servos, gyros and stabilizers at its main plant in Minneapolis. Later an entire new plant was equipped in Chicago for manufacturing the complete autopilot.

Production of the automatic pilot requires great precision and extraordinary special precautions. Minute particles of dust lodged in a critical part of the control will prevent proper functioning. Rust and other chemical actions, even in infinitesimal quantities, are major problems in manufacturing the autopilot.

Autopilots are assembled in glass-

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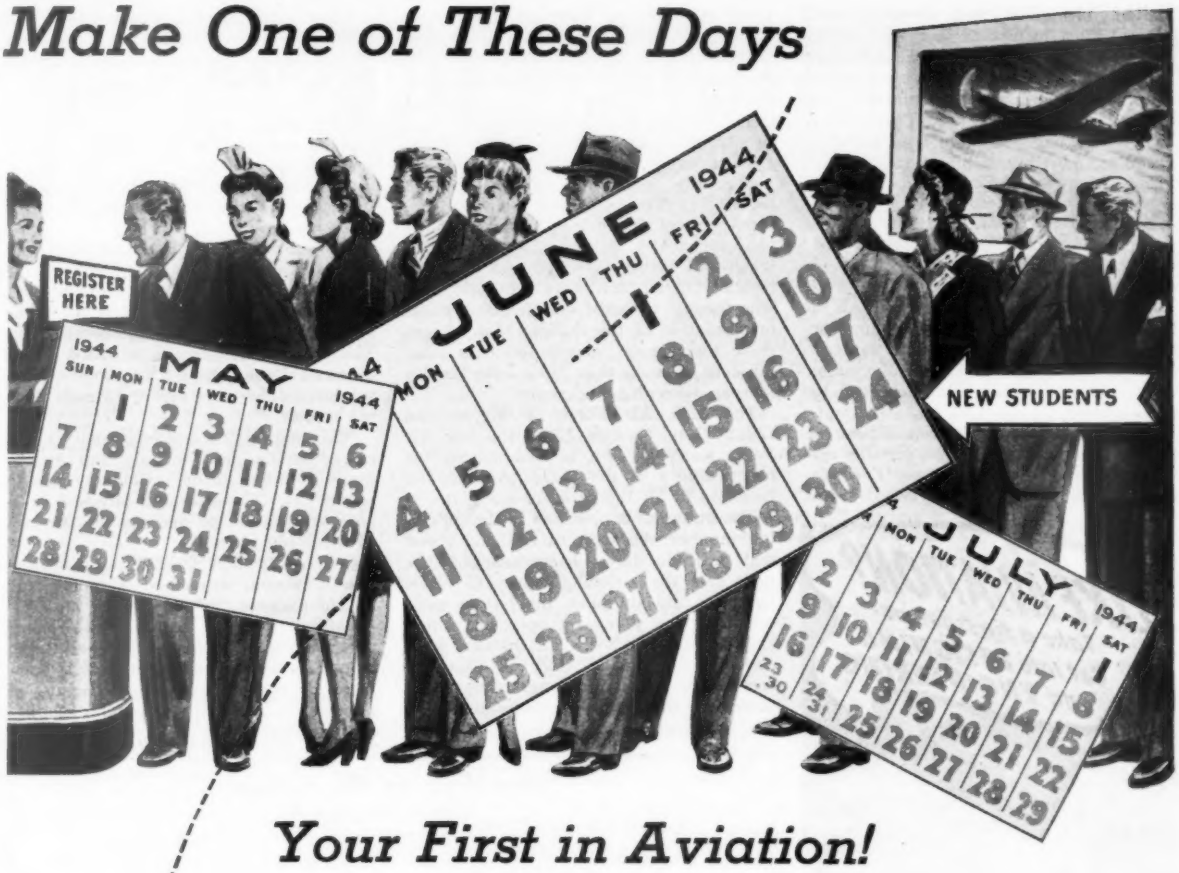

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The Army Air Forces changed the Navy designation (SBAE) of the autopilot to AFCE (Aircraft Flight Control Equipment) and then finally to C-1, which is the model now standard on all AAF bombers.

A few of the changes from SBAE to the improved C-1 included adding an electronic follow-up system and replacement of the original mechanical system. Other minor changes also increased its sensitivity.

Proof of the amazing capabilities of the C-1 autopilot came some months ago from England where a *Flying Fortress*, its fuselage almost cut in two by the wing of a diving German plane, was flown back to England and landed by the autopilot. The regular control cables to the tail and rudder were unusable and the plane itself was so badly damaged that it collapsed of its own weight shortly after landing.

Even after the autopilot was perfected, the bombing problem was not solved. Only a few AAF officers were convinced of the device's merits. They were gradually won over, and trained crews of two or three officers and five or six enlisted men were sent into each war theater to assist and instruct pilots on operation of the device. Many times these instructors participated in combat missions to prove that "their baby" really increased bombing accuracy.

The 12th Air Force in Egypt and Lieut. Gen. George Kenney's 5th Air Force were the first to demonstrate the practicability of the autopilot. Now all bombers in all theaters are using it.

The autopilot is operated in the following manner: as soon as cruising speed and altitude have been reached the pilot sets the autopilot controls. While flying on the autopilot, the human pilot can turn the plane by operating small knobs and switches. The human pilot can take control directly in cases of emergency by manually exerting more power on the control surfaces than can the automatic system.

Upon reaching the point where the bombing run is to start, the pilot turns the plane over to the bombardier. Setting the bombsight and automatic pilot dials, the bombardier actually flies the plane, putting it into evasive action by turning the dials in front of him. After the bombs are loosed, the pilot again takes control of the plane and heads for home, using the autopilot until he is ready to land.

In the latest production models of both the two- and four-engined bombers, the navigator's station also is equipped with controls so that he, too, can fly the plane as well as the pilots and the bombardier. The C-1 autopilot now is standard equipment on Boeing *Flying Fortresses*, Consolidated *Liberators* and the Beech *Kansas trainer*.

"On long flights, a pilot actually needs an automatic pilot to help him fly the plane without tiring," Colonel Jarmon points out. "Considerable physical pressure is required to operate the controls of these big planes."

Colonel Jarmon is sold on the autopilot. "We've never had a report that an autopilot was responsible for a crash," he states. "On the contrary, we've had about 50 instances where planes damaged in combat have been flown back to their bases by the autopilot alone because of damage to the plane's regular control mechanisms." END

'Ultra-High' on the Airways

(*Continued from page 43*)

the terms have definite scientific meaning. By general agreement among radio experts, frequencies in the range of 30 to 300 megacycles are called very high frequencies, those above 300 and to 3000 megacycles are referred to as ultra-high frequencies. But laymen and aviation people got to calling the airways installation UHF—and UHF it has continued to be until this day.

UHF, then, will first be installed on new domestic airways, now ready for construction under CAA auspices. Where they will be installed is not a military secret, but CAA officials can't talk till the Office of the Budget and Congress appropriate funds for the projects. The CAA estimates that UHF will be no more costly than low-frequency installations.

High-priority routes for UHF (which are already in operation) are the New York-Chicago run, which has been an ultra-high guinea pig for some years and therefore lends itself to quick conversion; and the mountainous route from Denver to Los Angeles.

The CAA has an over-all conversion plan which calls for UHF everywhere in the U. S. within three years, but Stanton, Bourne and their associates are sure of only one thing when it comes to looking abroad—again we lead the world. Germany is fooling around with the idea, but has been too busy with more pressing matters (for instance, the Eighth Air Force) to get very far. England's VHF is comparatively dormant for the duration, the Russians haven't, so far as is known, done anything. China's far behind on all such developments, and Canada and Australia are prepared to duplicate our system when we get it running smoothly.

Although the CAA lacks optimism on ultra-high's U. S. foreign post-war role, they are studying that one, too. Skepticism stems from four things—ultra-high ground installations have to be comparatively close together, eliminating their use on the long ocean runs; foreign continental installations will, generally speaking, be homemade; South America is so full of jungle in all the wrong places that closely-spaced UHF stations might prove too troublesome and costly, and radio is developing so fast that something better may turn up for the generally specialized foreign routes.

This summarizes the UHF story to date, but behind the summary is another saga of Yankee ingenuity.

It begins in October, 1937, in Indianapolis, when Joseph C. Hromada, then chief of the CAA experimental station in that city and now assistant chief of the technical development division, began UHF aviation tests, using 63 megacycles. Assisting him was E. S. Donovan of CAA. The work had progressed far enough by 1941, to justify an experimental contract with the International Telephone Development Company, which put its aspects of the development under the direction of Andrew Alford. In the meantime, during the winter of 1940, an experimental UHF route was put in between New York and Chicago. Mr. Hromada flight-checked this over a period of months. International Telephone con-

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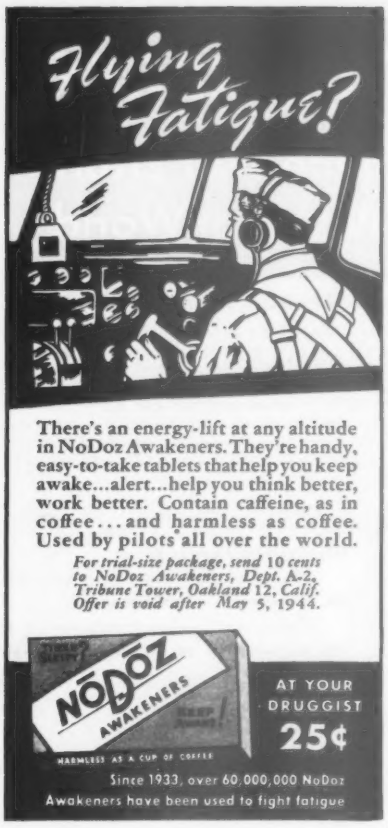
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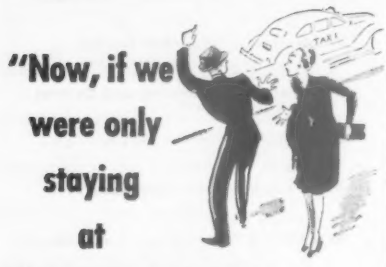

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tributed to the development of range units without voice, a development later simplified by CAA with the voice feature added. Other contracts were awarded just before the war stopped further development.

Undaunted, Hromada and other CAA airways experts continued to work with UHF, improving the New York-Chicago run until the initial installation became obsolescent. They also worked on local airport applications of UHF for the Army, at 108-111 megacycles. A parallel development was the "Z-marker" station location UHF installation, which resulted in fan markers in UHF, now being used on the airways at 75 megacycles. There are installations of these from coast to coast. Although plane sets coming from the Army will be receivers only, CAA has long had ready a receiver-sender which will be substituted as the airways go into post-war improvements.

Contracts for ground UHF installations have already been entered into by the CAA with Continental Electric, Newark, N. J., for rotating machinery, Air Associates, at Los Angeles, Calif., for supplementary range equipment, and the Wilcox, Gay Corp., at Charlotte, Mich., for transmitters. About 400 ranges will be installed in continental United States at an average of about 100 miles apart, the effective distance range for UHF being 50 miles at 1,000 feet. The higher you go, the greater the distance range, which is limited by the curvature of the earth.

Ultra-high will be the keynote of airway radio programs, according to Mr. Bourne. "It will eliminate static and provide a visual as well as an aural course, if not omni-directional courses," he points out. "We also see the necessity for two voice channels on every range station, the employment of ultra-high frequency for traffic control, ultra-high frequency localizers at all important airports, with glide path and ultra-high frequency markers to permit the pilot to land under instrument conditions."

"In the development of the ultra-high frequency range," he points out further, "quadrant ambiguities, which are present with the low frequencies, will be eliminated. This is accomplished by a combination of visual and aural signals by which the pilot always knows whether he is northeast, southeast, southwest or northwest of the range station without having to perform a complicated orientation procedure wasteful of time and fuel."

CAA officials stated that while the development of UHF goes forward, low frequency improvements will not be overlooked. They cite as proof the recent development of an automatic monitor designed to increase safety in low frequency operation. The monitor automatically advises the airport tower, the airways communication station, the airport offices of the various airlines using the range, and pilots in flight of any malfunctioning of the range. A similar device has been developed to monitor fan and Z markers. END

G. I. Navy

(*Continued from page 57*)

sissippi and Ohio rivers. Like many other men in the "G.I. Navy," Carroll adds a peculiar twist to the already unique situation of an army's navy.

Capt. Orville W. Haynes was assigned as first commanding officer of the Matagorda Island Post on March 15, 1942. A third 42-foot rescue boat was added to the fleet in May, 1942. By mid-summer of 1942, the island installation was rapidly approaching full-scale operations. Ground men and other troops were housed in a city of tents. Planes based on the island during aerial gunnery missions needed fuel, oil and other necessary items. These were supplied by the "G.I. Navy," which, on August 10, 1942, put into commission the largest unit in the fleet, an 83-foot rescue boat.

According to Maj. Travis Bailey, senior officer of the port, boats and headquarters are in radio and phone communication with flying control towers at Matagorda Island and Matagorda Peninsula. Boats, equipment and men must be ready for instant action at all times. Victims of accidents—or illness—requiring treatment at Foster Field usually are flown there by aerial ambulance. In non-flying weather, however, a speedy "P" boat makes the run across the island bay in a matter of minutes.

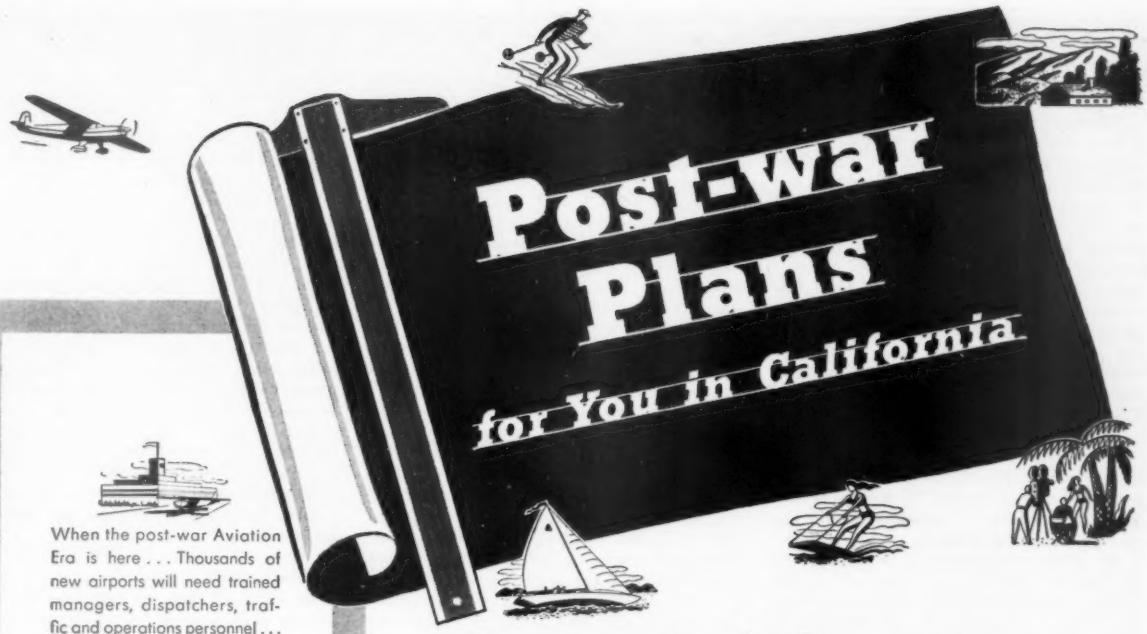
A pilot forced to "bail-out" when over water radios his control tower; his position is relayed to the nearest waiting rescue boat which can be under way before the pilot hits the water. A bearing is flashed to the speeding boat and its course checked by planes which circle over the swimmer.

Hot coffee and warm blankets await him when he is taken aboard.

The next immediate concern is the recovery of the disabled plane, whose position is carefully marked. A salvage barge grapples for the aircraft. Occasionally, it is necessary for a diver to descend to attach a rope or cable to the plane. Port O'Connor AAF seamen are also prepared for this emergency. Although few planes can be repaired after having dived into water, all coverable instruments and parts must be salvaged.

Flyers from advanced fighter schools—and many who have already seen combat—are assigned to Matagorda Peninsula, the base for fixed aerial gunnery. Here, combat pilots and instructors are taught the efficacy of deflection fire and the mathematics of "getting 'em the first burst." They then are returned to their units to instruct others.

Although it seemed odd to find doughboys in gob attire using Navy slang, that is not the only unusual mixture of the armed services at the Matagorda posts. Upon landing at Matagorda Island, the chances are that you will be met by a member of the Coast Guard driving an Army jeep! Yes sir, "Barnacle Bill" and "G.I. Joe" are the same guy in this Siamese-twin Army-Navy service. END



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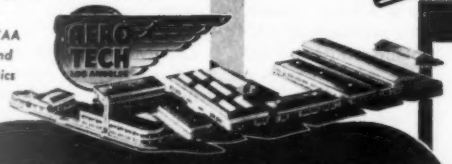

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I Learned About . . .

(*Continued from page 76*)

All was in readiness, so I turned in for a little sleep. Hauser stayed awake and warmed up my plane every hour or so. At about midnight, the telephone in the alert tent rang, and Operations informed me that heavy engine noises were reported about 60 miles to the east. I quickly threw on my gear and manned my plane. I was ready to go in a few minutes and, seeing the headlights of the jeep at the end of the runway, I gave her the gun. The take-off was normal. I climbed to 3,000 feet and began to circle the field in a wide arc. At 3,000 feet, I figured I would be below the enemy—who generally came in at about 5,000 feet—and I could silhouette him against the lighter sky. Throttling back and leaning out my mixture to get as inconspicuous an exhaust flame as possible, I slid my canopy back and waited.

My radio was working perfectly, but the reports that I was getting from the ground were confusing. The enemy did not seem to be coming in directly for the field as he usually did. First he was reported to the east, then to the north. The Japanese bombers were either lost or were going after another objective. Suddenly I saw, far off to the north, eight or 10 large yellow flashes. Almost simultaneously the radio reported that bombs were heard exploding. A few minutes later I got a report that the planes were heard heading eastward, so I knew they were on their way back home. It turned out later they really were lost and had dropped their bombs in the rice paddies.

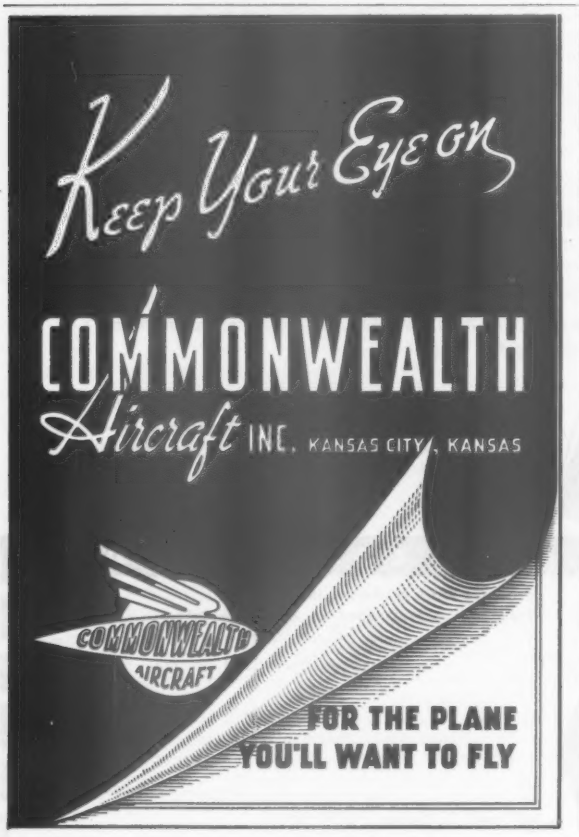
Thoroughly disgusted at the poor navigation of the Japanese which had deprived me of an exciting evening, I turned my attention toward landing. I let down to 2,000 feet and, flashing my running lights, I was rewarded a few minutes later by seeing the eight tiny pinpoints of light far below. I quickly ran through the landing check-off list. Everything was all set—wheels down, mixture in automatic rich and prop in low pitch. I was coming around the last turn now, concentrating on getting lined up with the runway. As I straightened up, I threw the flap handle to "down" and pushed the button on top of the stick to lower my flaps. Instantly my face and chest were covered with an oil-like fluid. It felt as though someone was standing about two feet in front of me spraying me with a garden hose. Later I found that a rubber gasket in the flap-actuating valve handle had blown out, shooting hydraulic fluid all over the cockpit.

I was in a very nasty spot. A pitch-dark night—300 feet in the air, indicating about 120 m.p.h.—and a film of sticky hydraulic fluid covering my goggles. I tried to wipe off my goggles with my sleeve, but found that impossible. I pushed them up from my eyes and stuck my head as far out of the left-hand side of the cockpit as possible. I still couldn't seem to get away from the blinding, stinging fluid. Just before my vision was again blotted out, I caught a momentary glimpse of the two red lanterns disappearing beneath the leading edge of my left wing. I knew I was over the edge of the runway—about 50 feet up and settling fast. I waited a split second, and then pulled back the stick. I hit the ground in a left skid, and the landing gear gave way with a lurch. For an instant, I thought I would be okay, as the plane skidded along on its belly. Suddenly there was a terrific crash, and I violently cracked my head against the windshield. The plane spun around and stopped with a jar. For a moment I sat stunned and blind in the cockpit. I heard a shout, and hands dragged me from the plane. I quickly came to, and when I had wiped the blood and oil from my eyes, I was amazed to see, by the lights of an approaching truck, the wreckage of a Chevrolet sedan that had been completely sheared in two!

I grabbed Hauser, who had driven up in the truck, and asked him who it was that had been so stupid as to park a car alongside the runway. He explained that one of the other pilots had driven up at the last moment and, thinking I needed more light for landing, had left it parked with the headlights shining down the runway. The driver of the car had meant to help, but his good intentions resulted in complete destruction of the automobile and an airplane damaged beyond repair.

I learned a lesson about flying that night, and I think several other people present did, too. That lesson was that if a pilot has made arrangements or plans to do a thing one way do not alter his plans without notifying him of the change. Once a pilot has taken off, he expects the ground personnel to follow his directions. If they feel they must make any changes, he should be informed in plenty of time to change his plans accordingly.

Undoubtedly many pilots have come to grief through the well-meant but unknown and unforeseen actions of others. I was lucky. I learned a valuable lesson with only a bump on the head to show for it. END



African Airline

(*Continued from page 70*)

Training flights were a regular part of the activities, with co-pilots becoming captains after passing their check flights and new co-pilots constantly arriving from the States. Many pilots held reserve Army commissions and were ordered automatically into military service when the ATC assumed control of the line in late 1942.

In addition, a large number of PAA men were commissioned as officers in the ATC and remained in key positions. George Kraigher, former operations manager for PAA's Western Division at Brownsville, Tex., who bossed the African airline as operations manager and was the spark-plug behind its development, remained to become a colonel and at last reports was a group commander in Africa.

The Army's absorption of the line was conducted smoothly and without friction. The ATC took over the operations department on October 15, 1942, although maintenance did not come under full military control until December. Virtually all of the civilians who wished to return home did so before Christmas of 1942.

One of the few differences between PAA and Army operation was a somewhat minor one. PAA, because of its wide Latin American and European connections, computes cargo weight in kilograms while the Army uses pounds.

Hence, weight reports requested by the Army had to be converted from kilos to pounds, a simple but tedious mathematical process of multiplying the kilo weights by 2.2, since a kilo is equal to approximately 2.2 pounds. END

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To Have and To Hold—

WAR BONDS

Truk Reconnaissance

(*Continued from page* 50)

lot, the kind to take you to hell and back and make you like it.

"We set off for Rabaul on January 6, 1942. The carburetor on Green's plane cracked and I left him at Rabaul, cursing his luck, as I proceeded to Kavieng in New Ireland. That was to be my jumping-off point for a round trip of 1,220 nautical miles. No one outside of the Japanese knew exactly what had been going on at Truk during all those years since World War I, when the islands were mandated to Japan. We suspected that the scene wouldn't be a peaceful one, despite the fact that the Nips were not supposed to fortify the atoll.

"I got into Kavieng, flying at 14,000 feet and evading, somehow, a Jap flight of bombers hell-bent for Rabaul, which fell to the enemy a few weeks later (January 23). I was to await orders at Kavieng. The code arranged was 'Southwind'—proceed on mission to Truk; 'Northwind'—return to Rabaul; 'Eastwind,' return to Townsville direct. At dinner time in Kavieng on January 8, I received this message: 'Titwillow-Southwind.'

"'Titwillow' took off from Kavieng at 5:44 on the morning of January 9. We were at 13,000 feet when McDonnell informed me we should be over the target. It was then 10:10 and I let her down. We ran into a heavy squall and came out over Truk harbor. Nice and peaceful all right. There were 12 warships of the destroyer and cruiser classes, an aircraft carrier, three large cargo ships, a hospital ship and eight four-engined flying boats at anchor. On the runways of one small island's airstrip heavy bombers were packed wing to wing. How many we didn't have time to count. We pulled up again and made a photographic run. We were halfway through before the Nips started to wake up and pour the ack-ack at us.

"Marriner was getting his gun ready. Coolly he reported, 'We're going to have company. Fighters taking off below.' But we still had work to do. McDonnell and I decided to make another camera run just to be sure. We'd feel silly if we went back empty-handed.

"In order to get good pictures of the Jap airstrip we made the second run as low as possible. We were getting plenty of antiaircraft fire now. The little fellows were really busy. They had a lot of planes in the air, too, and we were thankful for the squally weather. Enemy fighters were closing in on two sides. Marriner's runs were chattering and he was singing 'You'll come a-waltzing, Matilda, with me.'

"We felt something hit our tail and the controls all went sloppy for a moment. Then, all right again. We climbed to 10,000 feet, evading three Jap float planes that were too close for comfort. What lovely things clouds can be. We dived through, levelling off at 500 feet in the midst of one of the prettiest and most welcome electrical storms I have ever seen.

"Then we high-tailed it for Kavieng. Landing there we found that the only damage we had suffered was a missing tailplane tip, which had been shot away by one of the Japs. After an hour's rest, we proceeded to Townsville and turned over our film to Intelligence.

"The camera had worked 100 per cent."

Three weeks later a flight of Australian-manned *Catalinas* dropped the first bombs to land on Truk in this war. END

Flight Nurse

(*Continued from page* 56)

But there was more behind those few words. Ellen Church is the dean of all airline stewardesses. Thirteen years ago she and six other San Francisco nurses were engaged by United Air Lines to fly as stewardesses on the midnight run to Salt Lake City.

After she had flown close to 2,000,000 miles, Ellen Church retired from flying and took up a quiet life in her home overlooking the Golden Gate. When the war began she emerged from her well-earned retirement and is flying again with the Army Air Forces.

Many of these airline girls are flying with the same pilots with whom they flew on the commercial lines.

Scores of times the message has boomed out of the loud speaker in an operations office at Fort Worth: "Pilot on Trip 8 is Rentz—stewardess, Wisener."

Today, Lieut. Col. Robert J. Rentz is commanding officer at Stout Field, Ind., where the Troop Carrier Command makes its headquarters.

Colonel Rentz was walking along the hangar line to his office one afternoon when a sweet voice hailed him:

"Hey, Bob, what the dickens are you doing here?" It was Lieut. Phyllis Wisener, formerly of American Airlines, who made her first airline flight on a plane captained by Colonel Rentz.

"Hey, yourself, Phil. I'm commander of this base but what are you doing in that uniform?"

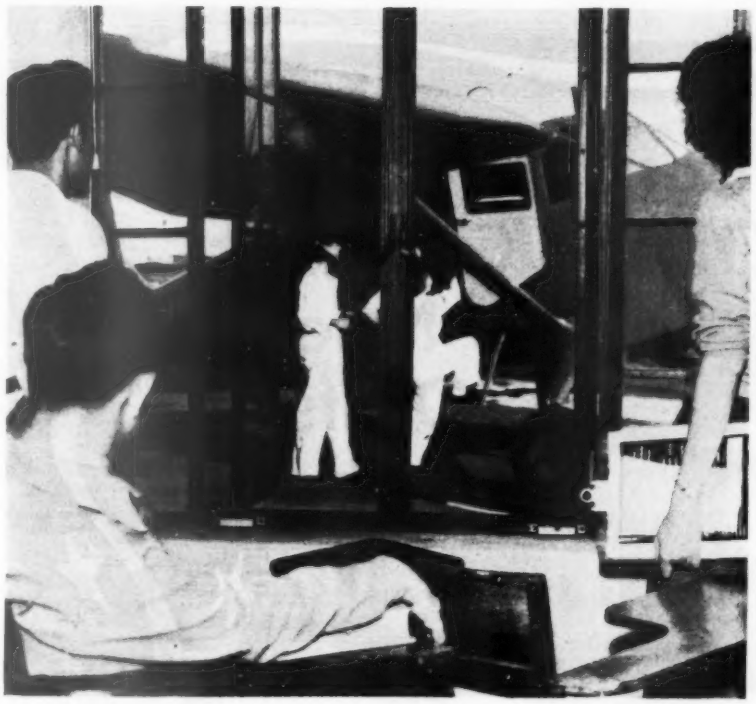
"I was just graduated from the Air Evacuation Unit at Bowman Field yesterday and am on my way." She was beaming.

Just as typical of America's flight nurses is the girl who had never flown before. Lieut. Elsie Ott is typical.

A few months ago Lieutenant Ott was doing routine nursing at a base hospital somewhere in India. She had been there a year—a veteran Army nurse. An orderly told her the commanding officer wanted to see her.

In a few minutes, the colonel was unfolding the details of a fantastic voyage

(*Continued on page* 170)



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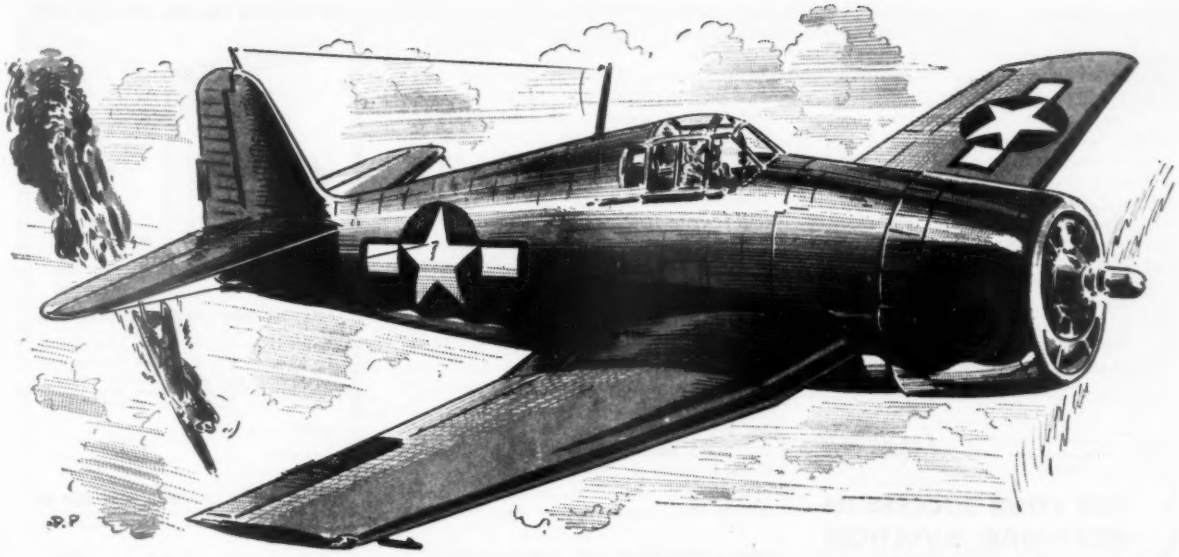

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"Even at the present time I am working on some Cleveland Models because I am in the hospital. I broke my back 6½ months ago while running some dive tests on a P-47 which caught on fire in the tail section while diving. I bailed out at 32,000 ft. and at 500 m.p.h. when my chute opened I broke my back. I received the D.F.C. for the 25 successful dives which I made before I bailed out.

"I have made a model of the P-47 and I chose a Cleveland Model because it is the most lifelike. The P-38 is my favorite airplane. I also made a Cleveland Model P-38, while I have been in the hospital. I have made P-6E, P-6 Polish Fighter, Jenny, DH4, Howard Race, Gee-Bee, Laird 400, etc.

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(*Continued from page 166*)

for Elsie Ott. She volunteered for the job, even though she had never as much as seen an airplane close enough to touch before.

"How long will it take you to get ready, Lieutenant?" the colonel asked.

"I'm ready right now, sir."

Aboard a four-engined ATC plane, Elsie Ott and two pilots loaded five sick and wounded enlisted men and officers. Destination: Walter Reed Hospital, Washington, D. C.

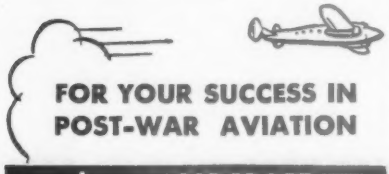
It is roughly 10,000 miles from that base in India to the National Airport in Washington and they covered the distance in less than a week. Each wounded man aboard needed attention every mile of the trip and Elsie Ott went without sleep to make sure her patients were adequately cared for.

High-ranking Army medical men gathered at the airport to meet the plane and heaped praise upon her. President Roosevelt awarded her the coveted Air Medal and she become the first woman to receive this medal. Then Elsie Ott was asked what assignment she wanted. She could write her own ticket in the Army Nurses Corps.

You've probably already guessed what post she took. Elsie Ott attended the next Air Evacuation class at Bowman Field, a student of what she had mastered at the first try. Here was the longest Air Evacuation flight on record. Her graduation day was a proud one for not only did General Borum pin wings on her tunic but he also made the Air Medal presentation on behalf of the president of the United States.

Today, in some obscure bastion, Lieutenant Ott is still flying. She'll remain in obscurity until the happy day of victory when Elsie Ott and thousands of her sisters in the sky will again become that "swell nurse over at the hospital" or "the beautiful girl I've got a date with tonight."

Until then, flight nursing will continue to kindle a flame of tradition unquenchable in its thirst for saving the lives of the sick, wounded and injured. END



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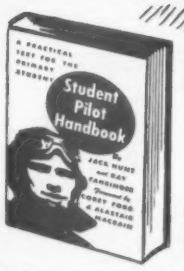

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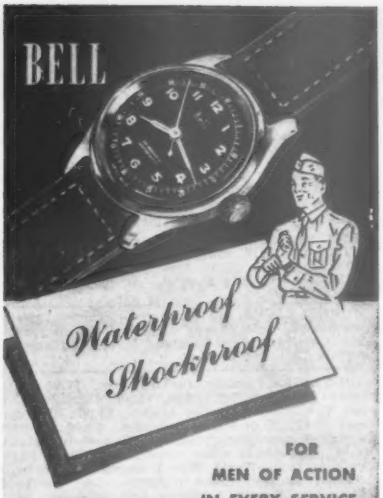

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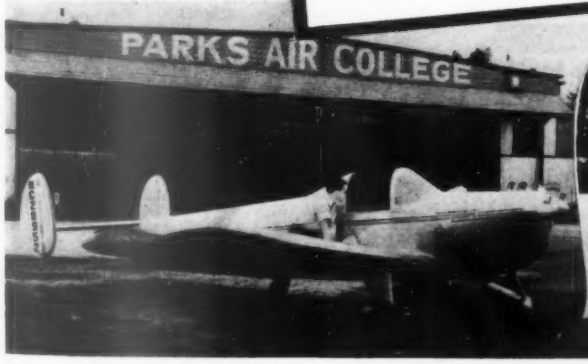

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